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September 17, 1956

Electrical World

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FORECAST:

1970

Steady Industry Growth

Pages 149-164

St. Lawrence Project Will Produce 1,800 Mw ... p 138

What Happened to Summer Peaks? . . . p 124

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 12 **September 17, 1956**

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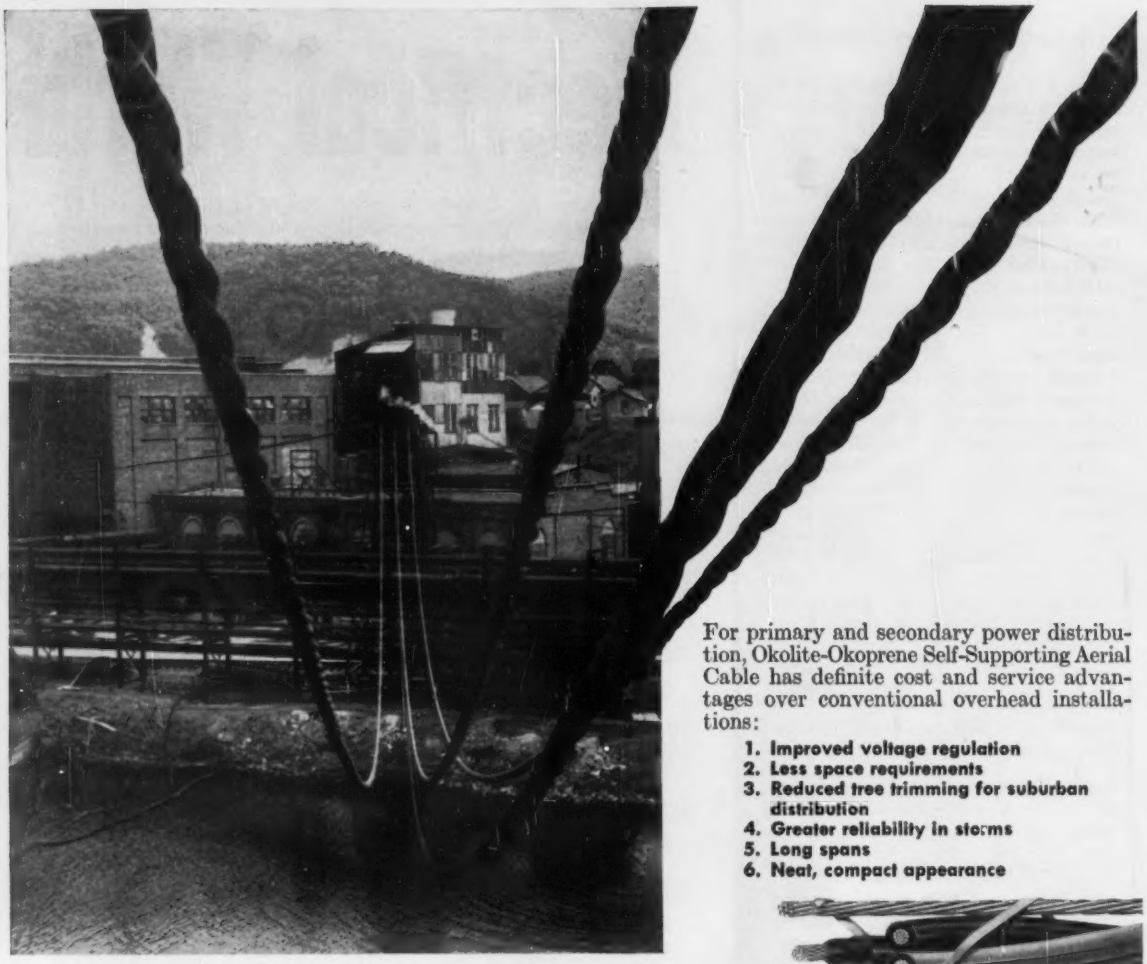

For primary and secondary power distribution, Okolite-Okoprene Self-Supporting Aerial Cable has definite cost and service advantages over conventional overhead installations:

1. **Improved voltage regulation**
2. **Less space requirements**
3. **Reduced tree trimming for suburban distribution**
4. **Greater reliability in storms**
5. **Long spans**
6. **Neat, compact appearance**

longer life span with OKOLITE-OKOPRENE *self-supporting cables*

The cost of using Okolite-Okoprene Self-Supporting Cables, *in many cases, is actually less than open wire construction.* This fact has often been documented where such factors as tree trimming, use of existing structures or pole lines, extra labor and hardware are taken into consideration.

These cables have an outstanding record for long-life service. During the past twenty years, experience has proved that, in all kinds of installations, the combination of Okoloy conductor coating and Okolite insulation with an Okoprene sheath provides a cable construction that gives maximum service life.

For complete engineering information including dimensional data, current carrying capacities, sag and tension formulas and splicing and terminating techniques, write for Bulletin EW-1074 "Okolite-Okoprene Self-Supporting Aerial Cables". The Okonite Company, Passaic, New Jersey.

Available with either copper or aluminum conductors

OKONITE SINCE 1878 ***insulated cables***

2949

Type No. 301
Triangular Structure

LIST OF MATERIALS

Quantity	Description
1	Crossarm
1 pr.	Wood crossarm brace
3	Pin-type insulator
1	Ridge iron, single
1	Crossarm pin, short shank
2	Crossarm pin, long shank w/saddle
2	Flanged washer 3" sq. x 3/16", ¾" tap
4	Machine bolt ⅝"
2	Curved washer 2½" sq. x 3/16", 11/16" hole
1	Spring washer
3	MF locknut ⅝"

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From the top of the pole to the bottom of the hole, Graybar offers you efficient flexible procurement of *all* the electrical supplies and equipment you need for pole-line construction or maintenance.

For one unit . . . or a thousand, the complete list of materials for the structure at left can be ordered together — from your nearby Graybar office or warehouse. For many structure types, we can also supply completely prebored and prefitted crossarm and hardware assemblies. Discuss your needs with a Graybar Outside Construction Specialist — he's experienced at gearing our service to utility needs. His friendly understanding of your problems is the result of Graybar's years of association with the utility industry.

Make it a point to call Graybar *first* — you can be sure your needs will be understood and accurately met. *Graybar Electric Company, Inc. Executive Offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.*

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GRAYBAR Everything Electrical

IN OVER 130 PRINCIPAL CITIES

FLORIDA POWER & LIGHT SELECTS S&C POWER

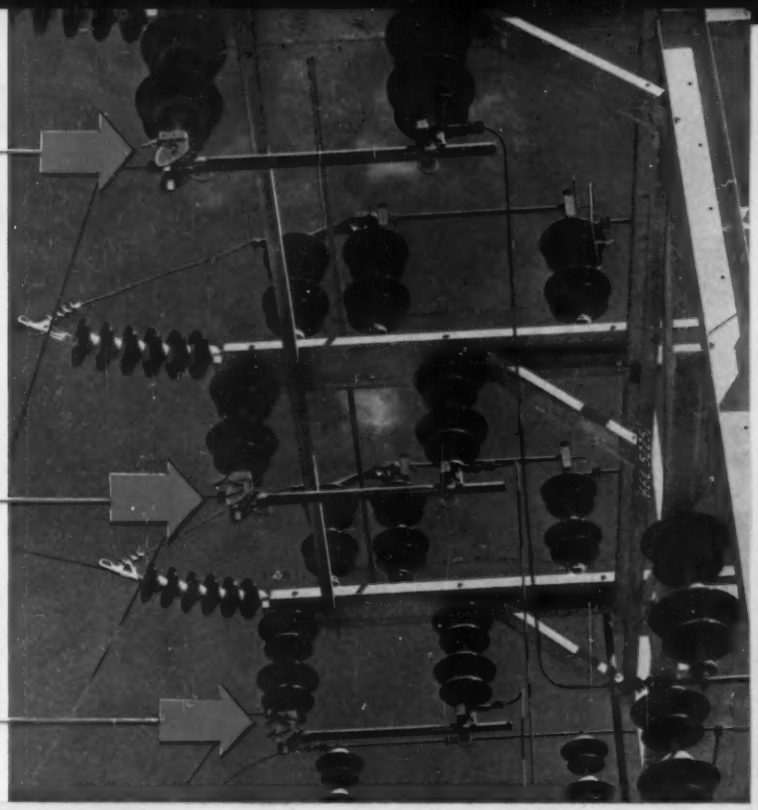
Florida Power & Light Company is the Sunshine State's fastest growing utility. Year after year more manufacturers, more businesses, and more commercial enterprises are moving into the territory it serves. Rapid population gains have increased customers by 138%, and more than tripled demands on the Florida Power & Light system since the end of World War II.

To satisfy these demands, Florida Power & Light has carried on an extensive power expansion program which, by the end of 1955, will have required the investment of $250,000,000 since V-J Day.

For an expansion program of such importance, it is only natural that the greatest possible care is used to make sure that service continuity is maintained and system equipment is protected.

Aerial view of the Hialeah section of Miami—one of the areas where rapid building of homes and industry has increased demand for light and power to six times what it was ten years ago. Hialeah Park is nationally famous . . . open the year around . . . host to hundreds of thousands annually.

COMPANY FUSES



For example, S&C Drop-Out Power Fuses—Type SMD (marked by arrows, right) are installed at Hialeah substation to protect two 7500 kva 69/13 kv transformers which serve Hialeah Park as well as the hundreds of homes and many small industrial plants which surround it.

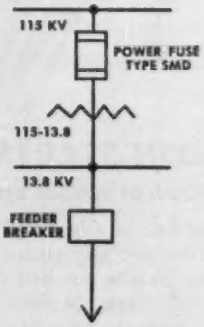
How S&C Power Fuses Are Used in the 69 Kv and 115 Kv System Protection Schemes

The transmission lines of Florida Power & Light Company are tapped at intervals to feed distribution substations. As was originally planned, the power transformers were not always provided with primary protection against secondary faults since primary breakers could not be economically justified.

After a 115 kv power transformer had been lost (for lack of such protection) the matter of protection was reconsidered. It was then decided that this protection was essential and that the device selected must meet these special requirements.

1. Provide system protection over a wide range of fault currents.
2. Coordinate with the transformer damage curve to provide maximum protection to the transformers.
3. Give complete coordination with secondary protective devices over the full range of fault currents.
4. Be capable of withstanding the recovery voltages which might be encountered under various fault conditions.
5. Be low in cost.

S&C Power Fuses, Type SMD, were found to meet all these requirements. Further details of Florida Power & Light's application of these fuses may be found in AIEE Paper No. DP 55-405.



Typical substation tapped directly from Florida Power & Light's transmission lines.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

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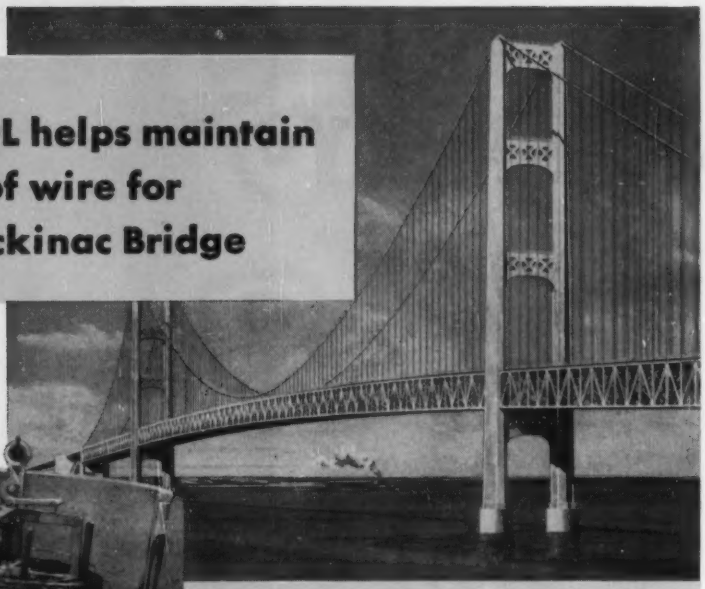
POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

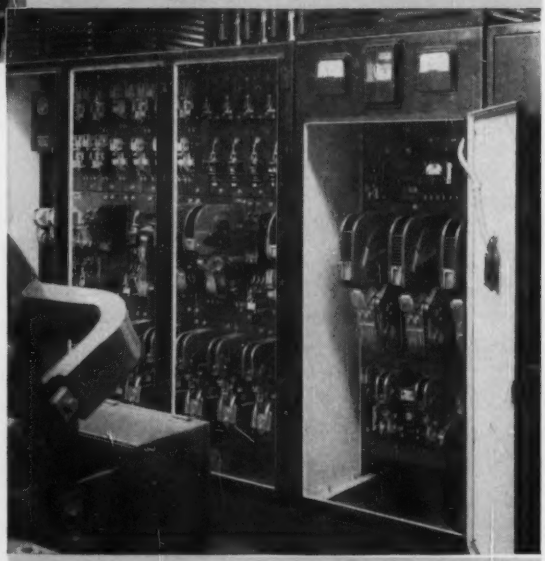
EC&M CONTROL helps maintain steady production of wire for giant cables on Mackinac Bridge



BRIDGE DRAWING • Courtesy of Dr. D. B. Steinman, Cons. Engr. INSTALLATION PHOTOS • Courtesy of American Steel & Wire Division of U. S. Steel Corporation, and Vaughn Machinery Co.

EC&M Wire block Controller *(at left)* for 60/75 HP, 500-1800 RPM, 230 Volt Motors.

At right is 725 HP, 440 Volt Synchronous Motor Starter for 500 KW Generator.



SMOOTH STARTS—QUICK STOPS

Wire drawn at speeds up to 700 feet per minute!

Mackinac Bridge, scheduled for completion in 1957, will connect the two peninsulas of Michigan and will stand as a great link in our national highway system. EC&M Control will have played an important role by helping maintain a steady flow of 0.192" diameter wire, drawn from rods, to make up the 2-ft. diameter suspension cables.

Good wire-drawing demands several things—ability to (*1*) thread at slow speed, (*2*) accelerate smoothly to continuous drawing speed, and (*3*) provide quick-stopping when the reel is finished or a snarl develops or the wire breaks. EC&M Control for wire machines is *custom engineered* and built to the size and number of motors per machine and to the demand for ever-increasing production-speed.

Consult EC&M on wire-drawing problems.

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EC&M DIVISION • CLEVELAND 28, OHIO

7410

5 Industries... Well-Known Companies

... typical of more than 100 companies for whom Grinnell is currently fabricating

POWER AND PROCESS PIPING

CHEMICALS
NATIONAL ANILINE DIVISION OF ALLIED CHEMICAL & DYE CORP., Hopewell, Va.

PULP & PAPER
UNION BAG & PAPER CORP., Savannah, Ga.

POWER
PENNSYLVANIA POWER & LIGHT COMPANY, Allentown, Pa.

BEVERAGE
CARLING BREWING COMPANY, Natick, Mass.

OIL REFINING
TIDEWATER OIL COMPANY, Delaware City, Del.

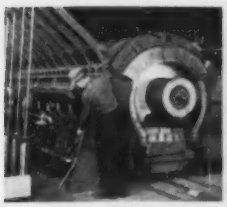
These successful companies, leaders in their respective fields, are building new facilities right now. The power and process piping needed in this construction is being fabricated in Grinnell shops.

In fact, at this time — or at any given time, more than one hundred similar-type orders for prefabricated piping are being worked on by Grinnell. Why this marked preference by so many companies for Grinnell?

Because piping fabricated in Grinnell shops is done under ideal conditions, with modern equipment, by personnel qualified for each class of work. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. All piping is rigidly inspected and tested to comply exactly with customer specifications and applicable codes. Consult Grinnell on your next piping job.

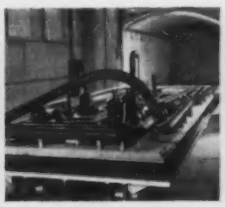
ATTENTION: *A 30-minute color sound film showing the quality and economy of Grinnell Shop Fabrication of all classes of piping is available for group showings.*

GRINNELL
WHENEVER PIPING IS INVOLVED

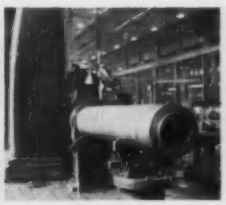


Pipe being heated to exact temperature required for proper bending

Skilled team completes bend in six minutes with pipe close to 2000°F



Fabricated piping, bending operation completed, enters stress-relieving furnace

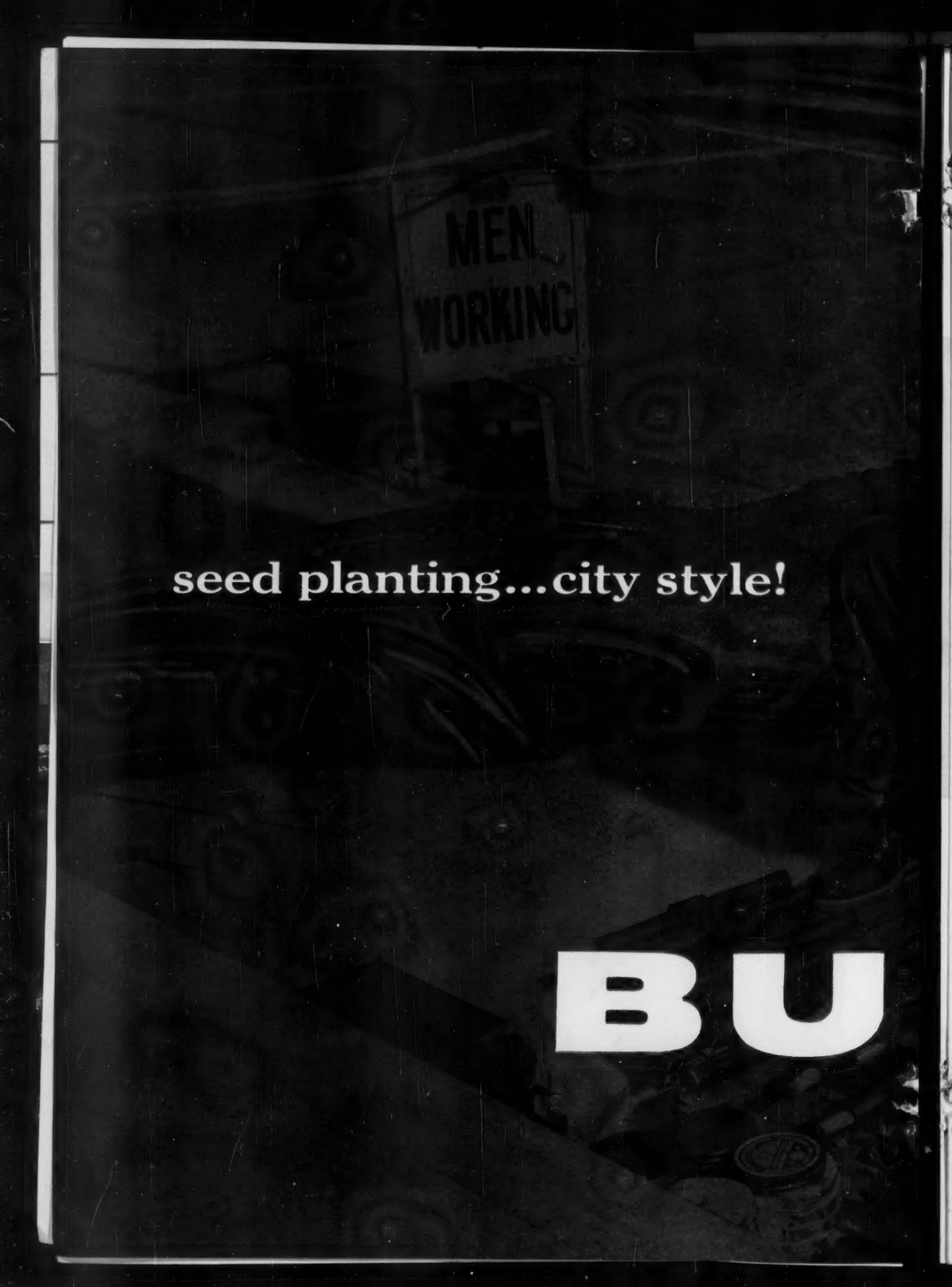


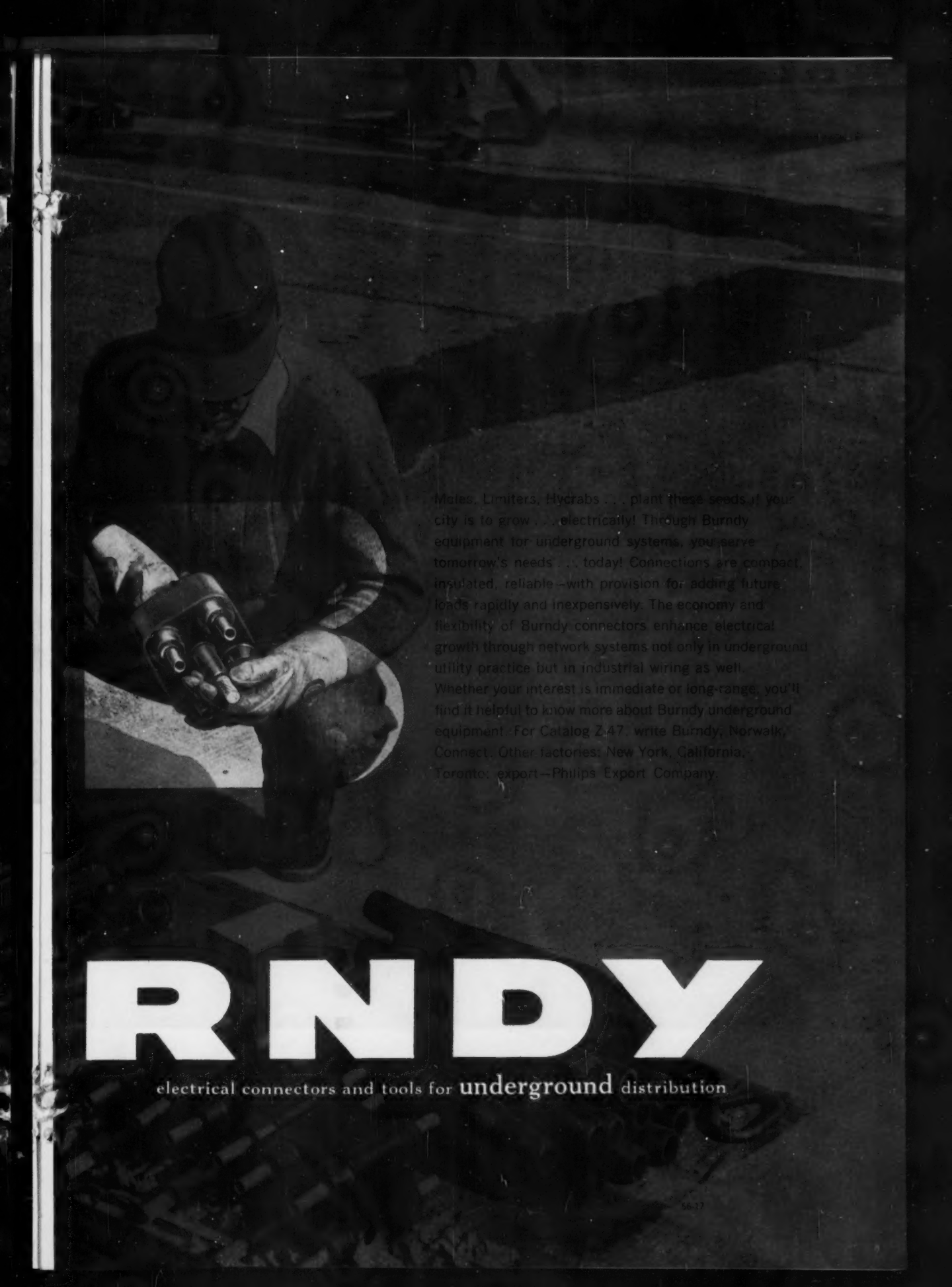
Heavy wall pipe being machined to the proper welding bevel on a post mill

Ultrasonic testing of a weld on heavy wall pipe

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems


MEN
WORKING
seed planting...city style!
BU



Molas. Limiters. Hydrabs . . . plant these seeds if your city is to grow . . . electrically! Through Burndy equipment for underground systems, you serve tomorrow's needs . . . today! Connections are compact, insulated, reliable—with provision for adding future loads rapidly and inexpensively. The economy and flexibility of Burndy connectors enhance electrical growth through network systems not only in underground utility practice but in industrial wiring as well. Whether your interest is immediate or long-range, you'll find it helpful to know more about Burndy underground equipment. For Catalog Z-47, write Burndy, Norwalk, Connect. Other factories: New York, California, Toronto; export—Philips Export Company.

RNDY

electrical connectors and tools for **underground** distribution

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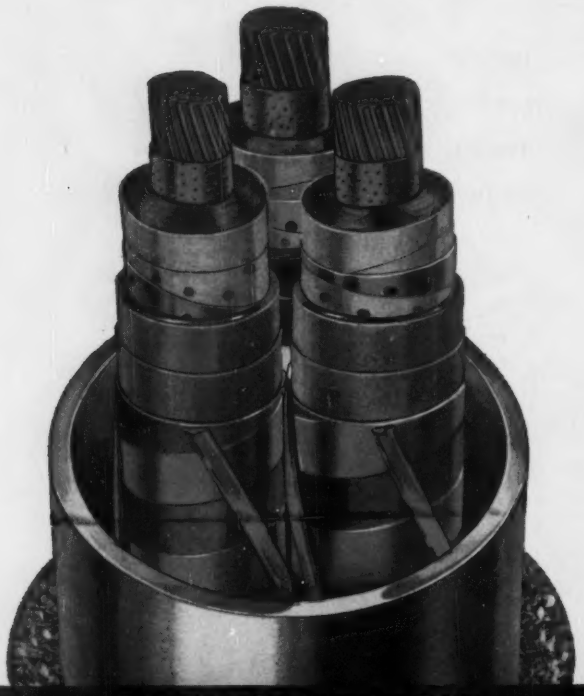
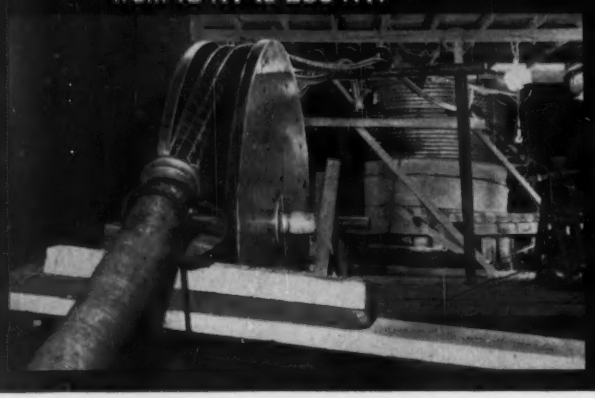
Phelps Dodge

WIDEST RANGE OF HIGH



Pipe Type, Compression Cable,
from 15 KV to 230 KV.

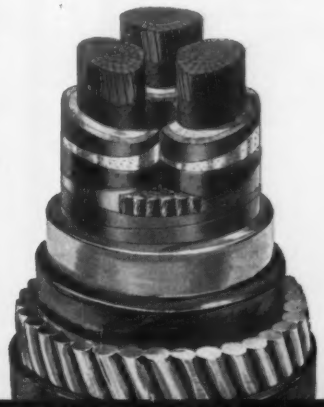
Low Pressure, Oil-Filled Cable,
from 15 KV to 230 KV.



Consult Phelps Dodge for the correct answer
to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.



Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.

Submarine Cable, from 15* KV to 35 KV.

Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

why the Riley TURBO

. . . why it eliminates flyash disposal
. . . why practically any available fuel
. . . why higher operating economies

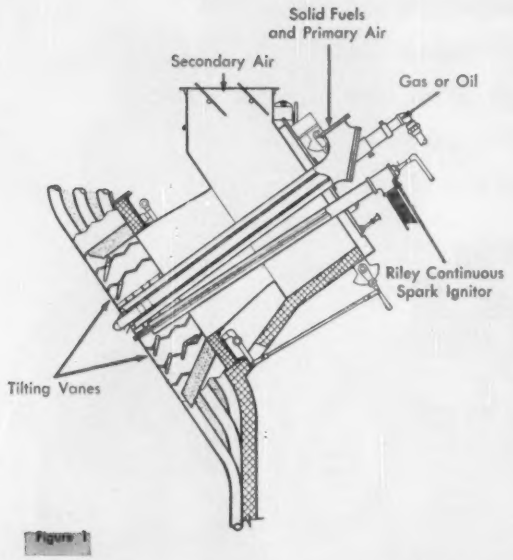


Figure 1

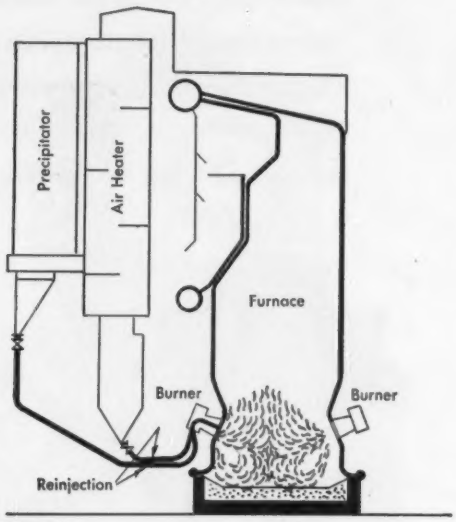


Figure 2

In 1952 a well known eastern chemical company had costly flyash disposal problems at two of its plants. At the time Riley Stoker Corporation had been developing a new type of slag tap furnace design to permit refiring flyash and disposing of it as slag. The idea was accepted. Two Riley boilers with the new furnace were installed . . . one to refire its own flyash, the other to refire its own and that of an adjacent conventional dry bottom unit.

The success of these boilers in eliminating the problem of flyash disposal is a matter of record . . . but the real success story lies in the other outstanding operating characteristics of this type of boiler unit, operating characteristics long sought by engineers and designers.

METHOD OF FIRING

Riley directional flame burners (Fig. 1) inclined slightly downward and located opposite each other in opposite furnace walls (Fig. 2) produce an extremely hot turbulent flame in a restricted, concentrated combustion zone just above the slag pool. Temperatures are high enough to maintain a fluid slag pool even at low loads.

MINIMUM CARBON LOSS

When flyash is refired in the combustion zone practically all the carbon in the ash is burned with residue turning to molten slag. Unburned losses are infinitesimal even in small boilers. Efficiencies of 90% and over are attained and sustained.

LOW FURNACE EXIT GAS TEMPERATURE

A "top secret" of the Riley *Turbo Furnace* is low furnace exit gas temperature produced by bottom-of-furnace firing. Temperature curves in Fig. 3 show *Turbo Furnace* exit gas temperatures at 100 F. to 220 F. below those of a conventional dry bottom unit operating at the same load, having the same capacity and the same amount of water cooling.

FURNACE EXIT TEMPERATURES THE SAME WITH ANY FUEL

The curves in Fig. 3 also indicate that in the *Turbo Furnace* the exit gas temperatures of a variety of fuels are approximately the same. For example, when burning natural gas the furnace bottom contour produces a luminous flame similar in size and appearance to coal flame; result: almost identical furnace exit temperatures.

USES A MULTIPLICITY OF FUELS

Because exit gas temperatures are so nearly identical with any fuel, the *Turbo Furnace* is uniquely suited for high steam temperature installations where uniform steam temperature is wanted while burning coal, lignite, gas, oil, fluid coke, or a combination of these fuels.

NO SOOT AND SLAG BLOWERS NEEDED

With retention of the major portion of ash in the furnace bottom and with resulting low temperatures in

An Advertisement Prepared By

Riley designs, manufactures and erects steam generating units complete with

Worcester New York Philadelphia Buffalo Pittsburgh Cleveland Detroit Chicago Cincinnati Charlotte New Orleans

FURNACE is so versatile

and does away with slag blowers
can be burned in it at any time
are attained and sustained

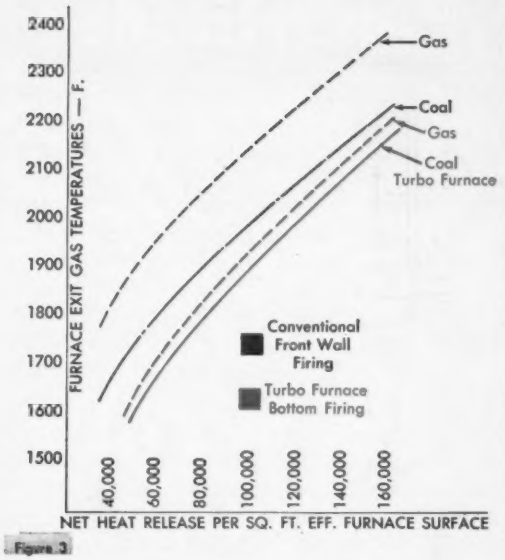


Figure 3

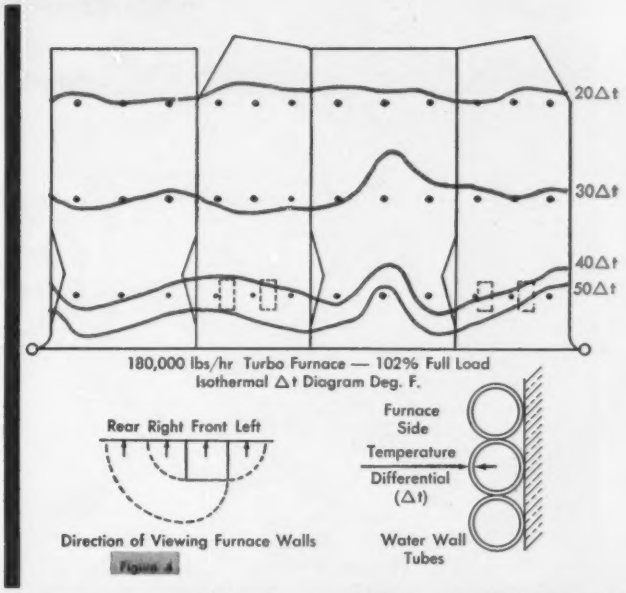


Figure 4

the upper part of the furnace no slagging occurs even with ash of lowest fusion temperatures. Since combustion is restricted to furnace bottom there is no impingement of flame on furnace wall tubes. Only a light dust coating on furnace walls and on convection tube bank occurs. (Fig. 4) illustrates the effect of the cleanliness of the *Turbo Furnace* . . . relatively flat isothermal lines obtained in tests on one of the chemical company's units from readings of centerline thermocouples.

SIMPLIFIED DESIGN AND CONTROL OF SUPERHEATER AND REHEATER

With heat distributed evenly within the furnace and constant temperatures maintained regardless of fuels used the design and control of superheater and reheater for the *Turbo Furnace* unit is greatly simplified.

OPERATION POSSIBLE EVEN WHILE CHANGING TO SOLID FUEL

With pressure parts constant for all fuels a *Turbo Furnace* installed initially to fire gas or oil and designed with a furnace heat release compatible with coal firing can "stay on the line" during installation and hook up of solid fuel handling equipment. No ash hopper has to be added, and Riley directional flame burners are already equipped with coal heads for quick connection to pulverizers.

HIGHER HEAT RELEASES SMALLER SETTINGS

With lower exit gas temperatures the *Turbo Furnace* can be designed for higher heat release rates of both furnace envelope and furnace volume. A smaller furnace without a hopper bottom results in lower overall height.

ONE LEVEL BURNER OPERATION

Burner operation at or near the turbine level has long been desired. The Riley *Turbo Furnace* with all its burners on one level near the bottom of the unit makes one level operation a practical reality.

VERSATILE OPERATING FEATURES REFLECTED IN RECENT PURCHASES

An eastern seaboard public utility will operate three 500,000 lb. per hour *Turbo Furnace* units designed specifically to burn fluid coke plus oil, gas, coal. A Louisiana public utility has ordered a 1,550,000 lb. per hour reheat unit to fire natural gas, but for future conversion to solid fuels. Three 320,000 lb. per hour *Turbo Furnace* units will be installed by a prominent aluminum producer for gas, oil and future pulverized coal. A Texas public utility has purchased an 825,000 lb. per hour reheat unit for natural gas and future pulverized coal or lignite. Another Texas public utility has ordered a 1,260,000 lb. per hour reheat unit for gas firing and future pulverized lignite.

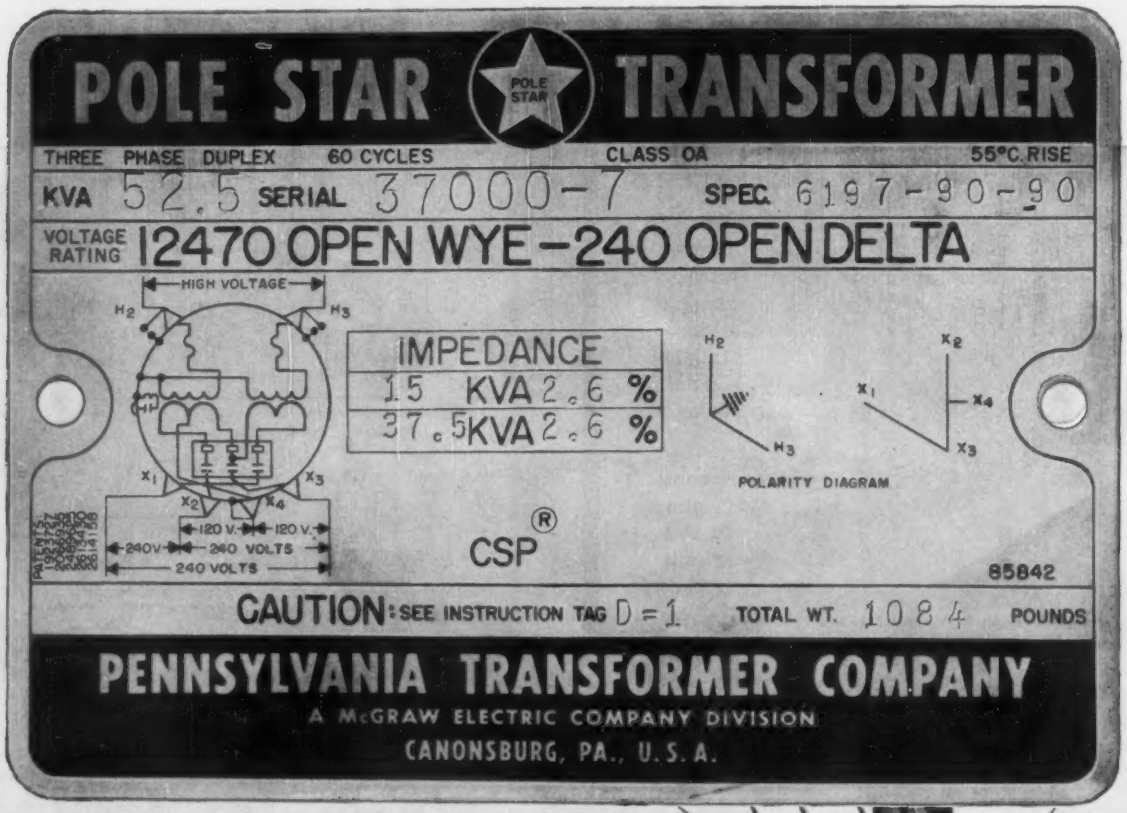
Such acceptance of a relatively new design is recognition of the sound operating advantages involved.

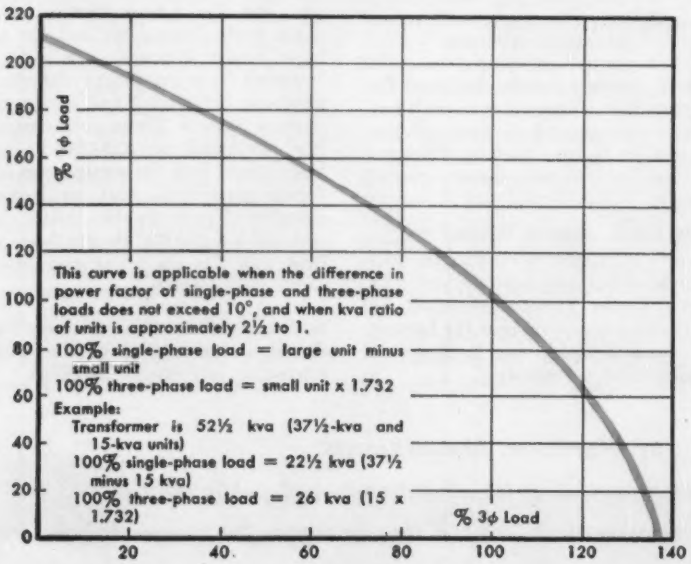
RILEY STOKER CORPORATION *of Worcester, Massachusetts*

heat recovery equipment and fuel burning equipment for all industries and public utilities.

Atlanta St. Louis Kansas City St. Paul Houston Denver (Englewood) Salt Lake City Los Angeles San Francisco Portland Seattle

Announcing the NEW





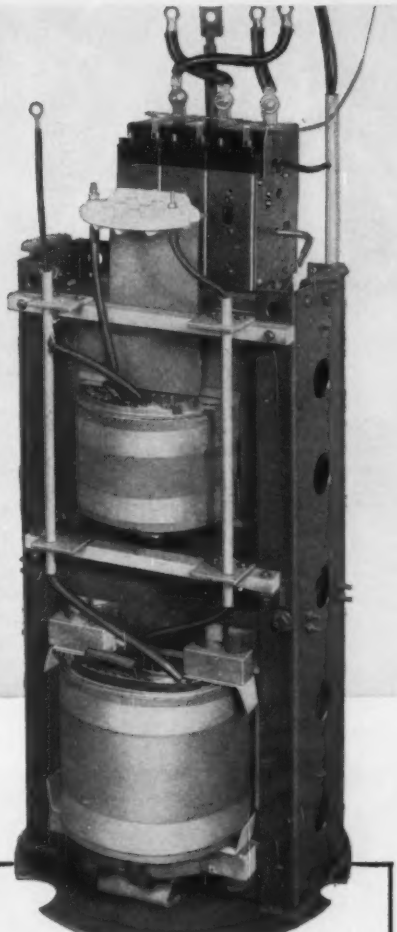
POLE STAR® DUPLEX TRANSFORMER

for Simultaneous Single- and Three-Phase Service from a Single Pole-Mounted Transformer

Pennsylvania's new Pole Star Duplex Transformers provide an efficient, economical answer wherever multiphase service is required from pole-mounted transformers. This is especially true in areas where three-phase air conditioners are used. By eliminating the need for banks of two or three units, Pole Star Duplexes simplify installation . . . lower initial costs. Mounted directly to the pole, the new duplexes require no extra cross-arms . . . make a neater appearance than do banks of transformers.

Pole Star Duplex Transformers are composed of two standard core-and-coil units mounted in a single tank — the most common combination being 37½ and 15-kva units to provide a total capacity of 52½ kva. The units are connected in open wye, open delta as shown on the opposite page, and may be equipped with CSP protective equipment.

Like all other Pole Stars, the new duplex transformers feature Pennsylvania's patented lap-on-top core. Thus, you can solve multiphase power problems and also get the low exciting current and low core loss for which Pole Stars are noted.



The internal assembly shown here is a 52½-kva Pole Star Duplex, formed by combining 37½-kva and 15-kva units. Other available ratings are: 20 kva (15 and 5 kva) . . . 35 kva (25 and 10 kva) . . . 40 kva (25 and 15 kva) . . . 62½ kva (37½ and 25 kva).

A Southwestern Utility Writes of These "Distinct Advantages" of Duplex Installations

1. "Their appearance is better. This becomes more and more important as the rapid increase in three-phase residential load requires more transformer installations very close together.
2. "In the event of trouble or overload on the secondary, all three phases will be interrupted by the CSP breaker*, not permitting single phasing due to secondary trouble.
3. "May be more readily installed on existing poles.
4. "More adaptable for use on poles where secondaries are dead-ended.
5. "Heat dissipation of large tank, common to both single-phase units, permits greater flexibility in overloading one or the other of the single-phase units."

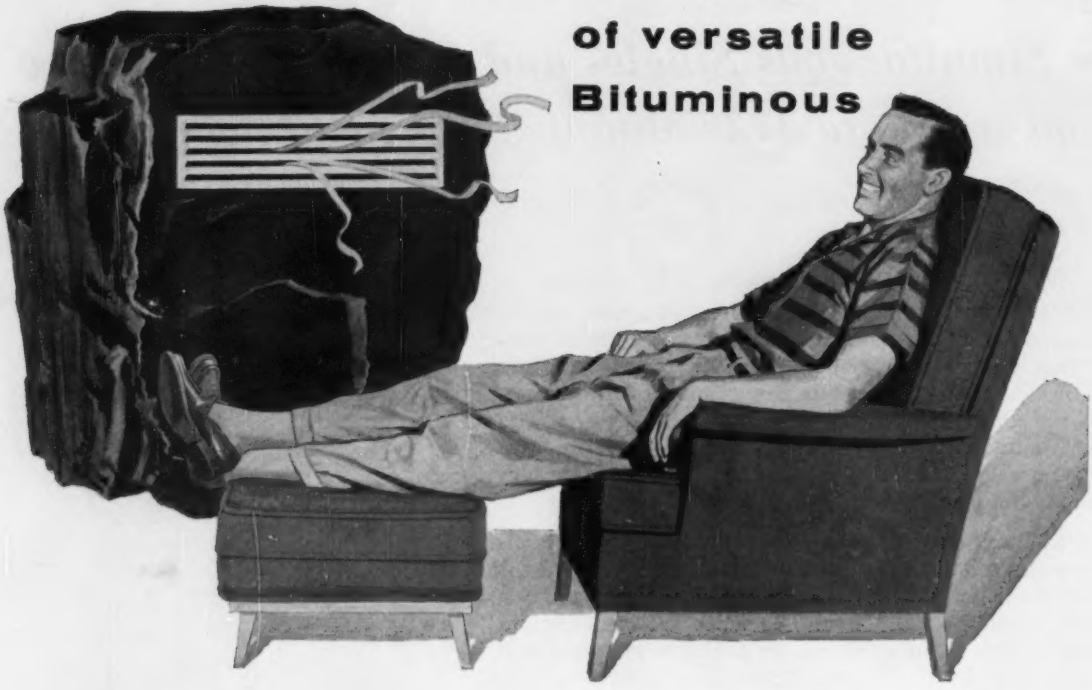
**Pole Star Duplex Transformers are available either with or without CSP protective equipment.*

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Cool Customer...

of versatile Bituminous



➔ What's cool about coal?—air conditioning, of course. The energy required to bring its cooling comfort to more and more millions must be plentiful and economical. B&O Bituminous coal fits that specification to a "cool-T". *There's lots of it*—billions of tons of proven reserves! *It's convenient* to the spots that need cooling; near to the greatest concentrations of population and industrial activity. *It's mined with constantly improving efficiency*—that means economical, constant-cost for today and tomorrow. Whether it's air conditioning or other mechanical marvels, *you can bet Bituminous is behind them! Ask our man!*

LET OUR COAL TRAFFIC REPRESENTATIVES HELP YOU
Vital information about stable-low-cost Bituminous coal will be pinpointed to your specific operation.
COAL TRAFFIC DEPARTMENT, B&O RAILROAD,
BALTIMORE 1, MD. LExington 9-0400

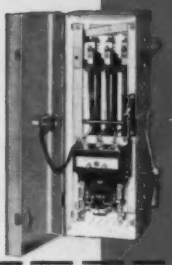
Baltimore & Ohio Railroad

for
SMO-O-O-O-TH
starting
without
line disturbances

ALLEN-BRADLEY
Quality

Reduced Voltage Motor Starters

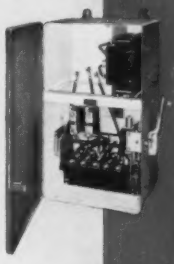
MANUAL STEPLESS RESISTANCE TYPE



Graphite compression disc resistors provide smooth, stepless starting of polyphase squirrel cage motors—prevent lamp flicker. Operated by a hand lever, the smooth starting of the motor is under the control of the operator.

BULLETIN 640

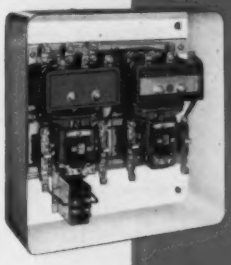
MANUAL AUTOTRANSFORMER TYPE



Recommended where the characteristics of the driven load or power company rules require reduced voltage starting. Double break, silver alloy contacts are standard for air-break starters . . . copper contacts for oil-immersed units.

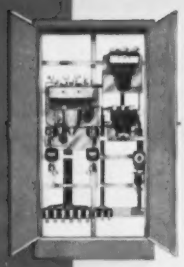
BULLETIN 646

AUTOMATIC PART-WINDING TYPE



For use with squirrel cage motors having two separate parallel stator windings. Two types—Style A, two step starter; Style B, three step starter having resistance in series with motor on the first step.

BULLETIN 736

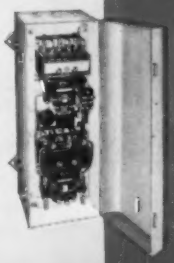


AUTOMATIC MULTIPOINT RESISTANCE TYPE

Meets power company starting current rules on network systems. Resistors are automatically inserted in the line at starting, and are short circuited in steps at definite time intervals which can be adjusted from 1 to 5 seconds.

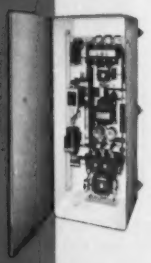
BULLETIN 741

AUTOMATIC GRAPHITE RESISTOR TYPE



Graphite disc resistors are automatically inserted in series with the squirrel cage motor at starting. These resistors can be steplessly adjusted for motor and load conditions, resulting in remarkably smooth acceleration of the motor.

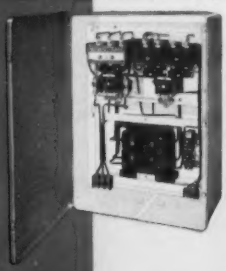
BULLETIN 740



AUTOMATIC STEPLESS GRAPHITE RESISTOR TYPE

The ultimate in velvet smooth acceleration of squirrel cage motors. Lamp flicker on network systems used for both power and light is eliminated. The graphite disc resistors are compressed automatically . . . smoothly and steplessly.

BULLETIN 742



AUTOMATIC AUTOTRANSFORMER TYPE

Utilizes an autotransformer connected in open delta to reduce line voltage for starting squirrel cage motors. Taps are provided on the autotransformer to adjust the voltage applied to the motor.

BULLETIN 746

7-56-M

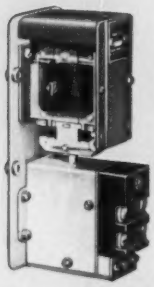
A-B Quality

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

TIMING RELAYS!

Installing instantaneously operated contact block with one N.O. and one N.C. contact



Bulletin 849 "On-Delay" timer. By inverting solenoid, timer is converted to "Off-Delay" operation.

Timer Adjustment

The timing interval can be adjusted quickly and easily by turning the adjusting screw.

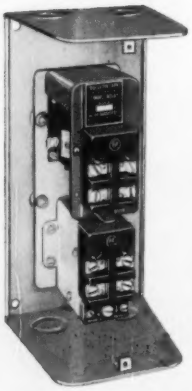
Tell Us About YOUR TIMER NEEDS . . . Allen-Bradley Has the RIGHT ANSWER!

Here is a line of pneumatic timers that can be adjusted for a consistent time delay of 1/6 second up to 3 minutes. Air, drawn into the timer through a needle valve, is freed from dirt and dust down to submicroscopic size by a high efficiency glass fiber paper filter. Thus the time settings are accurately maintained over long periods. These timers can be expected to operate reliably under conditions of severe atmospheric contamination.

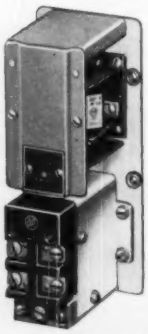
An outstanding feature of these timers is the wide variety of types available, and the modifications which can be made in the field, such as adding one or two instantaneously operated auxiliary contacts. Also, it is easy to change an "On-Delay" timer to the "Off-Delay" operation, or vice versa—by simply inverting the operating solenoid. The "On-Delay" timer provides the time delay *after* the magnetic operating COIL IS ENERGIZED; the "Off-Delay" timer provides the time delay *after* the operating COIL IS DE-ENERGIZED.

The Bulletin 849 timer has one normally open and one normally closed contact. As usual, the Allen-Bradley double break, silver alloy contacts are maintenance free. Auxiliary contacts can be mounted as shown below.

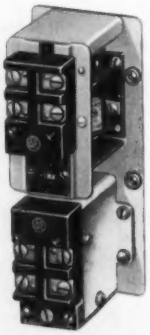
A few typical Bulletin 849 Pneumatic Timer combinations



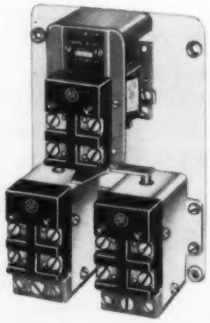
Bulletin 849 timer with one N.O. and one N.C. auxiliary contact.



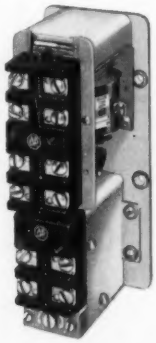
Bulletin 849 "Off-Delay" pneumatic timer with time delay *after* the coil is de-energized.



Bulletin 849 "Off-Delay" pneumatic timer with one N.O. and one N.C. auxiliary contact.



Bulletin 849 "On-Delay" pneumatic timer with two adjustable timing units.



Bulletin 849 pneumatic timer with two N.O. and two N.C. auxiliary contacts.

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY
QUALITY
PNEUMATIC TIMERS

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

7-56-MR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
SEPTEMBER 17, 1956

There's a bright future in store for the nation's electric utilities. You can't help but get that impression from Electrical World's latest long range industry forecast appearing in this issue.

Residential use will account for a large part of the future growth of energy sales. Average residential use (2,751 kwhr last year) will jump to 2,995 kwhr by the end of this year and 3,258 by the end of '57. Continued increases will put use at 8,070 by 1970. In conjunction with customer gains these increases will push residential sales to 134.8 billion kwhr in 1956, 150.5 billion kwhr in '57 and 510 billion kwhr by 1970.

• • •

Industrial sales will also set new highs this year despite year-long softspots in some industries. Although the industrial production index will increase only 2.2% this year, industrial energy sales will jump 10.3% to a new high of 274.9 billion kwhr. In '57 this figure will go to 293.1 billion kwhr. By 1970 it will stand at 634.5 billion kwhr—more than double next year's sales.

Increasing commercial and "other" sales will join with residential and industrial to push total industry sales to 529.6 billion kwhr in 1956. Next year will see another jump to 572.6 billion kwhr. Further increases will push total sales to 1,486 billion kwhr in 1970.

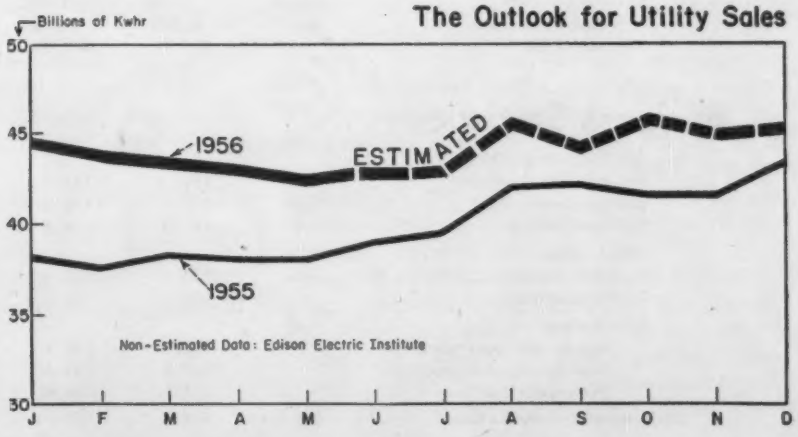
Utility capital spending will reflect these sales increases. To provide new facilities electric companies will spend $3.8 billion in 1956, (4.4% more than '55), $4.3 billion in '57, $5.6 billion in '60 and $11.3 billion in 1970.

Getting the materials and equipment for new facilities may be a problem. You can get some idea of the pressure that will be put on equipment manufacturers by comparing utility purchases of major items in 1955 with what they'll need in 1960.

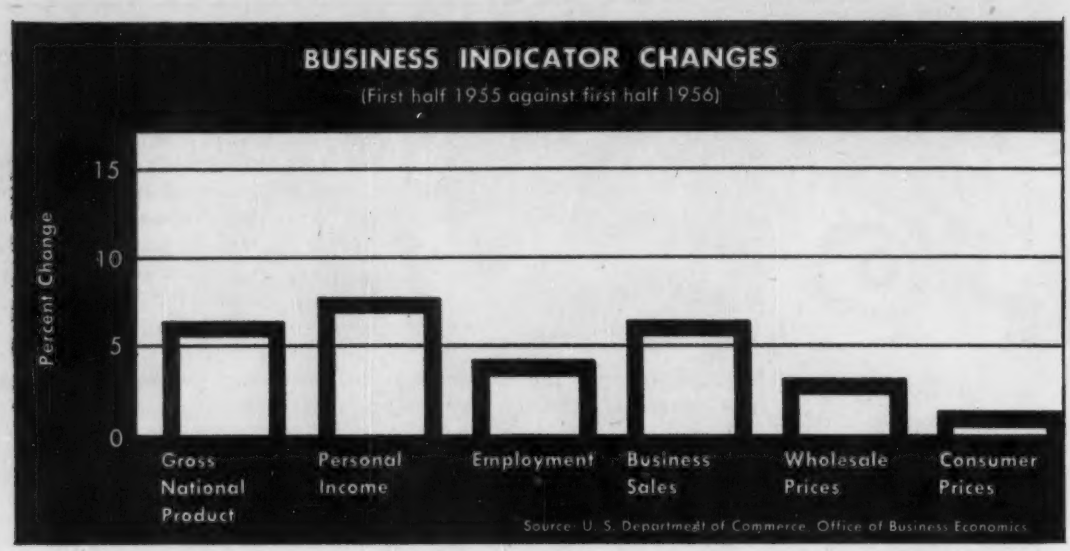
• • •

Expenditures for turbine generators (which hit a record last year) will be up another 15.4% by 1960. Wire and cable purchases will climb from $276 million last year to more than $383 million in 1960—up almost 40%. Other major items in big demand will be power transformers (up 75%) and distribution transformers (up 38%).

The Outlook for Utility Sales



STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity, Peak—Class 1 Systems, Estimated Dec. '56 Peak (million kw)	May / June / June	117.43 / 97.00 / 106.06	116.78 / 92.6 / 106.00	106.32 / 86.6 / 103.46	10.4 / 12.0 / 2.5
Production—billion kwhr	May	49.09	47.49	43.35	13.2
Hydro		11.70	11.55	9.81	19.3
Fuel		37.39	35.94	33.54	11.5
Sales—billion kwhr	June	44.53	44.18	40.10	11.0
Residential		10.98	11.02	9.62	14.1
Commercial		7.28	6.74	6.51	11.8
Industrial		23.80	24.04	21.62	10.1
Other		2.48	2.38	2.36	5.1
Fuel Consumption	June				
Coal—million tons		12.34	12.05	11.07	11.5
Oil—million barrels		4.61	4.47	4.69	− 1.7
Gas—billion cu. ft		127.04	110.51	107.42	18.3
Net Income Class A & B Co's—$ million	June	102.20	103.15	92.00	11.1
Residential Customers—millions	12 mos	44.99	44.87	43.76	2.8
Revenue per kwhr	ended	2.62¢	2.62¢	2.67¢	− 1.9
Avg kwhr per customer	June 30	2,879	2,858	2,649	8.7
Avg annual bill		$75.43	$74.88	$70.73	6.6

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	July	129	141	130	− 0.8
ENR Construction Cost	Sept.	147.8	146.0	141.0	4.8
BLS Cost-of-living	July	117.0	116.2	114.7	2.0
NEMA Sales					
Insulation materials	June	156	158	158	− 1.3
Electric appliances		106	103	118	−10.2
Wholesale prices	May				
Motors and generators		132.1	130.4	120.8	9.4
Transformers and regulators		137.5	135.3	127.3	8.0
Switchgear and fuses		151.2	149.0	135.6	11.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

Your Business

Enough light. For your work tasks, the important thing is to have enough light. For reading it doesn't make any difference whether the light source is over your left shoulder or right shoulder or directly above the book so long as reflection doesn't bother you. For other tasks it's best to place the light source so you won't be working in the shadow of your hands.

Lighting fixture month. A queen has already been chosen to remind us that October is "lighting fixture month."

Air travel tips. Some of the most useful tips for the air traveler we've seen is put out in a leaflet distributed by Wallachs, the well known New York men's store. Among the hints: Dress for destination, particularly if flying to a different climate. To trim baggage weight, pack lighter shoes, wear heavier ones. Put identifiable stickers, or painted marks, on both ends of your luggage—to allow you to pick it out promptly at the airport baggage counters. On planes many travelers prefer a central position and a right-hand seat for a smooth ride.

"Junior, did you remember to tell the meter reader we were having the basement steps fixed?"

Your Health—Tuberculosis

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

It started with a chest x-ray survey. Areas of tuberculosis had been found in his lungs. This husky 52-year-old man's only complaint was a persistent cough. He had raised some blood-tinged sputum on occasions. Examination revealed live tubercle bacilli. Modern drugs and bed rest should eventually cure him. Isolation in a sanatorium will prevent spreading of the disease.

Tuberculosis causes the death of 45 people of all ages each day. The death rate has been reduced almost 95% since 1900, yet ⅓ of the population have live tubercle bacilli somewhere in their bodies. Five percent of these infected people will have active tuberculosis during their lifetime.

Many people possess a resistance to the tubercle bacillus. This is probably obtained by having had a light attack of the disease. Resistance may be lowered by a faulty diet, injury, other diseases, climatic factors or alcoholism.

The common way of getting the tubercle bacillus into the body is by inhaling it. It is spread by the sputum of infected persons. It is found in milk from tuberculous cows or mothers. It may be in the stools and urine of infected persons. Symptoms appear in a few days or a few years.

There are two types of tuberculosis—the childhood or primary, and the adult or re-infection type. When the tubercle bacillus enters the body an inflammation occurs at the entrance site. In most cases this primary attack confines itself to the lungs and surrounding lymph glands. Eventually the lesions calcify and become small nodules. Resistance to further infection is developed in this way. Primary tuberculosis can spread and be disabling or fatal. The symptoms may be nil or those of a chest cold. The diagnosis is made by a skin sensitivity test called the tuberculin test.

Chronic pulmonary tuberculosis is the prevalent form of the disease. It is preceded by the primary type. X-ray examination of the chest is the principal diagnostic means. A chronic cough with sputum containing live tubercle bacilli, loss of weight and strength and a temperature rise are common symptoms. Bleeding from the lungs occurs in 30 to 35% of cases. The disease may spread to any part of the body. Absolute bed rest for many months is a must. The first months of treatment should be spent in a sanatorium. Peace of mind and mental rest are as important as physical rest. There are several new antimicrobial drugs which are effective. They must be taken under careful supervision. Surgery may be necessary in some cases.

There is no dependable immunity to tuberculosis. Yearly x-ray examination of the chest is an effective way of detecting the disease. People with chronic coughs should consult with their physician. Tuberculosis is a public health menace which causes nothing but human misery and economic disaster.

WASHINGTON COMMENT

Do We Need an FPC for Atomic Plants?

Electric utilities in the atomic power business may one day be dealing with two atomic agencies in Washington instead of one.

This prospect comes as a result of the demands from the Congressional Joint Committee on Atomic Energy for a reorganization of AEC.

The idea is to create a separate agency for licensing and regulation of non-government atomic industry. It would be apart from the agency that would operate the present AEC plants producing atomic materials and conducting research and development.

Anderson Wants Reorganization

Both Chairman Clinton P. Anderson (D-N.M.) and Chet Holifield (D-Calif.) recently issued statements calling for the reorganization and promising that they would introduce legislation to this end in the next session of Congress.

Actually, they have lost no time in starting the preliminary work. The Joint Committee staff is now making a study of possible ways of implementing the proposal.

The study includes an examination of existing regulatory agencies with a view to determining the structure a proposed AEC licensing unit should take.

The idea of such a reorganization of AEC along the lines presently contemplated is not new.

For some time it has been felt that some day it would be essential.

However, this need was tied to the time when the atomic industrial base would be broad enough to support a separate licensing and regulatory agency.

But Anderson and Holifield now claim that the recently issued temporary construction permit for a reactor in Detroit has precipitated the need for a reorganization of AEC.

This was the latest of several shots they fired at AEC in the case of the Power Reactor Development Co's project.

What particularly angered Anderson and Holifield about the PRDC incident was that AEC first refused, with what they considered unwarranted assumption of judicial prerogatives, to reveal details of a safety report on the project. It took a full Joint Committee resolution to insist on the report that finally pried it loose from AEC. But then AEC requested that it remain "administratively confidential."

Thus, in calling for the reorganization of AEC, Anderson says: "In such an amendment (to the 1954 Atomic Energy Act) I would make it mandatory that full disclosure of safety hazards be made to the public, and to state and local governmental bodies before a construction permit is issued."

Sure to Bring Partisan Fight

Anderson and Holifield charge that the PRDC case proves that the objectivity of AEC's quasi-judicial functions is being colored by AEC's promotional and developmental responsibilities. In other words, they imply, if AEC were not obligated to show progress in nuclear power reactor developments, it would never at this stage have issued a construction permit to PRDC.

The licensing and regulatory functions of AEC now are performed as a function of the division of civilian application.

In the light of the manner in which the proposal for reorganization of AEC has come about, it appears certain that any proposed legislation will precipitate a partisan fight in Congress. It is also possible, though, that preliminary joint committee staff investigations will reveal that any reorganization proposal is premature at the present.

TECHNICAL NOTES

Lightning protection for generators may be more effective with arresters at the main transformers than at the generator terminals.

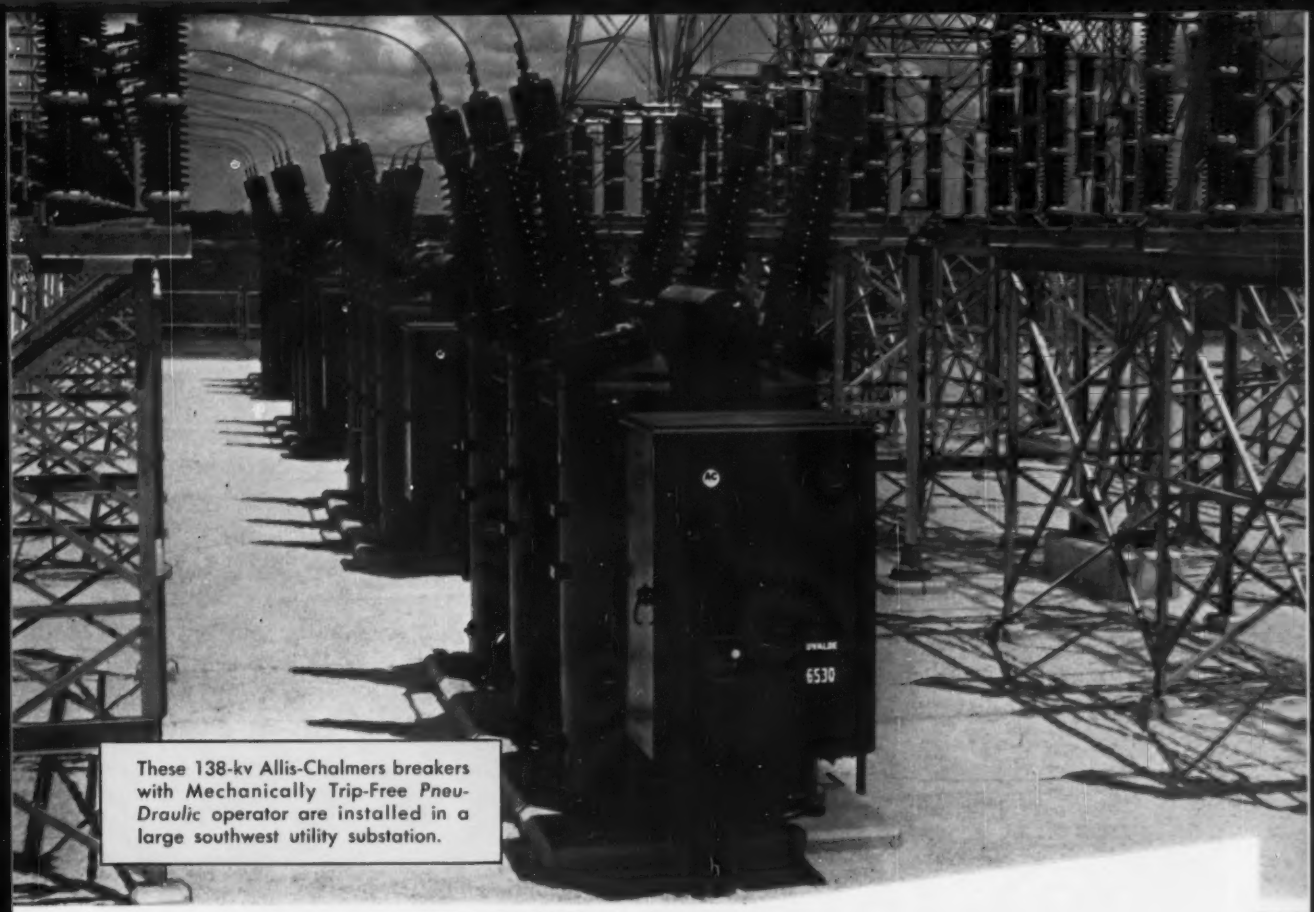
Air-blast circuit breakers are economical for 300 kv and above.

Sun, wind, and rain age paint faster on hot surfaces of outdoor power plants. But annual painting keeps them presentable with little more effort than the less frequent but more extensive painting of an indoor plant.

Lightning arrester tests with 10 x 20 μsec shots of current give discharge voltages approximating the 1½ x 40 μsec voltage waves used to coordinate insulation protection.

Outdoor power plant maintenance in winter can proceed under temporary shelter as long as required facilities outside the shelter, such as the crane, remain operable.

Separately driven exciters give flexibility when turbine-generator fields are preheated for quick starting.



These 138-kv Allis-Chalmers breakers with Mechanically Trip-Free *Pneu-Draulic* operator are installed in a large southwest utility substation.

You Get MORE Positive Protection with Allis-Chalmers Mechanically Trip-Free Breakers

this breaker **Mechanically Trip-Free** FOR **POSITIVE PROTECTION**

Pneu-Draulic and *Turbo Jet* are Allis-Chalmers trademarks.

● All Allis-Chalmers breakers are fully Mechanically Trip-Free. Only in Mechanically Trip-Free breakers are contacts and closing mechanism uncoupled . . . enabling contacts to open at full rated speed without restriction from mechanism . . . under *all* conditions. Pneumatically or hydraulically trip-free breakers cannot give you this protection.

Time-Proved

Allis-Chalmers has used this simple operator mechanism principle since 1933.

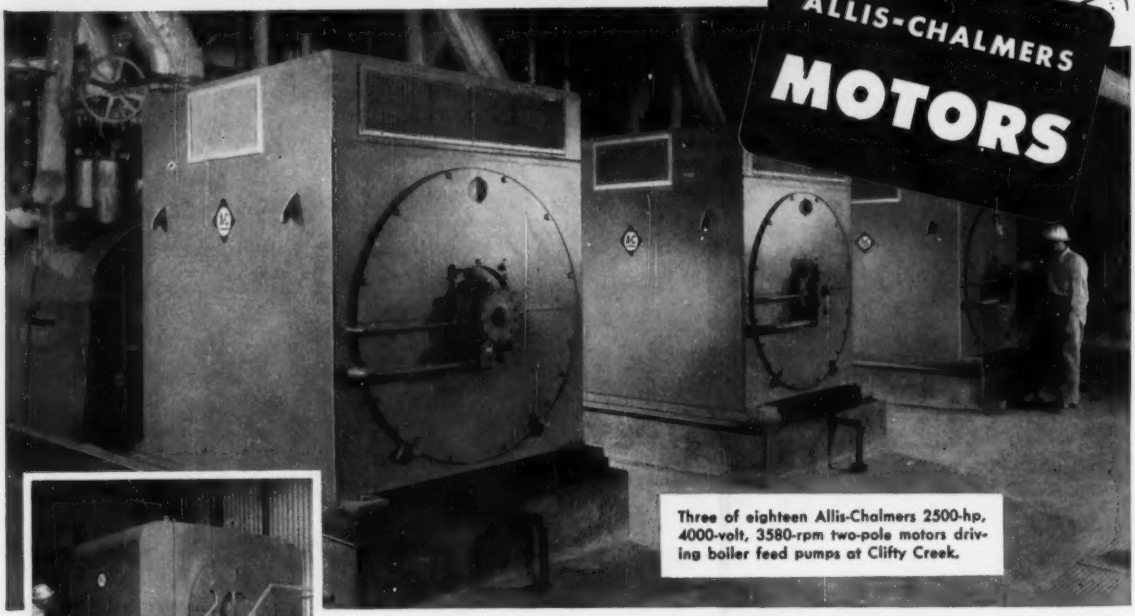
Get details on this and other features of Allis-Chalmers breakers, such as the *Pneu-Draulic* operator and the completely tested *Turbo Jet* interrupting device. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-4979

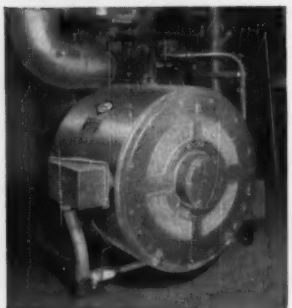
Furnishing Major Auxiliary Drive Power

at Indiana-Kentucky Electric Corporation's Clifty Creek Plant



Three of eighteen Allis-Chalmers 2500-hp, 4000-volt, 3580-rpm two-pole motors driving boiler feed pumps at Clifty Creek.

Rooftop installation of Allis-Chalmers 1500-hp, 4000-volt, 1185-rpm weather-protected motors. This is one of twelve Allis-Chalmers motors giving dependable service driving forced-draft fans at this modern new plant.



Allis-Chalmers 250-hp flange-mounted motor driving plant air compressor. This unusually economical mounting method for such a large motor can be attributed to Allis-Chalmers experience in motor applications throughout the electric power industry.

A wide variety of Allis-Chalmers motors furnish most of the major auxiliary drive power at Clifty Creek Plant near Madison, Indiana. Allis-Chalmers motors are driving plant air compressors, coal handling equipment, forced-draft fans, boiler feed pumps and many other pumps.

The Allis-Chalmers motors at this Indiana-Kentucky Electric Corporation installation are just a few of the complete line of motors Allis-Chalmers builds for power plant service. Contact the Allis-Chalmers district office in your area, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for complete information. A-4956

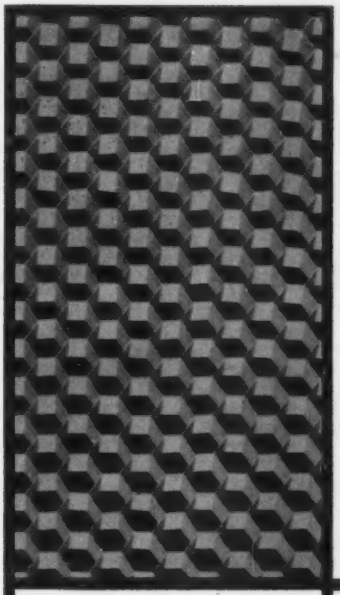
Now, You Can Get Even Greater Winding Protection with SILCO-FLEX

all-silicone-rubber motor insulation. Available only on Allis-Chalmers motors — in many of the larger sizes. Ask your A-C representative for the facts about this revolutionary new insulation system.

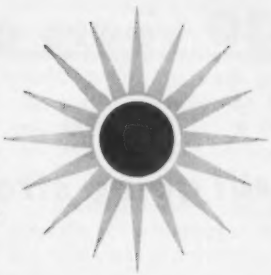
Silco-Flex is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

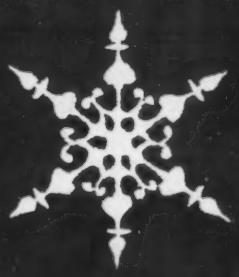


THIS IS HONEYLITE®



Bright as a summer day

quiet as a winter night



Honeylite—the all metal light diffusing acoustical aluminum honeycomb—sets new highs in light transmission efficiency...and at the same time, and in the same place... reduces noise to new lows.

Honeylite's 95% plus efficiency puts a soft, even light in every corner of the room, while producing the minimum surface glare.

Honeylite's noise reduction coefficient of .46 keeps rooms quiet, and costs down by eliminating the need for acoustical baffles.

Honeylite may be used wherever pleasant, non-glare interior light is the goal. Because it weighs only two ounces a square foot it can be suspended from any simple T-bar system.

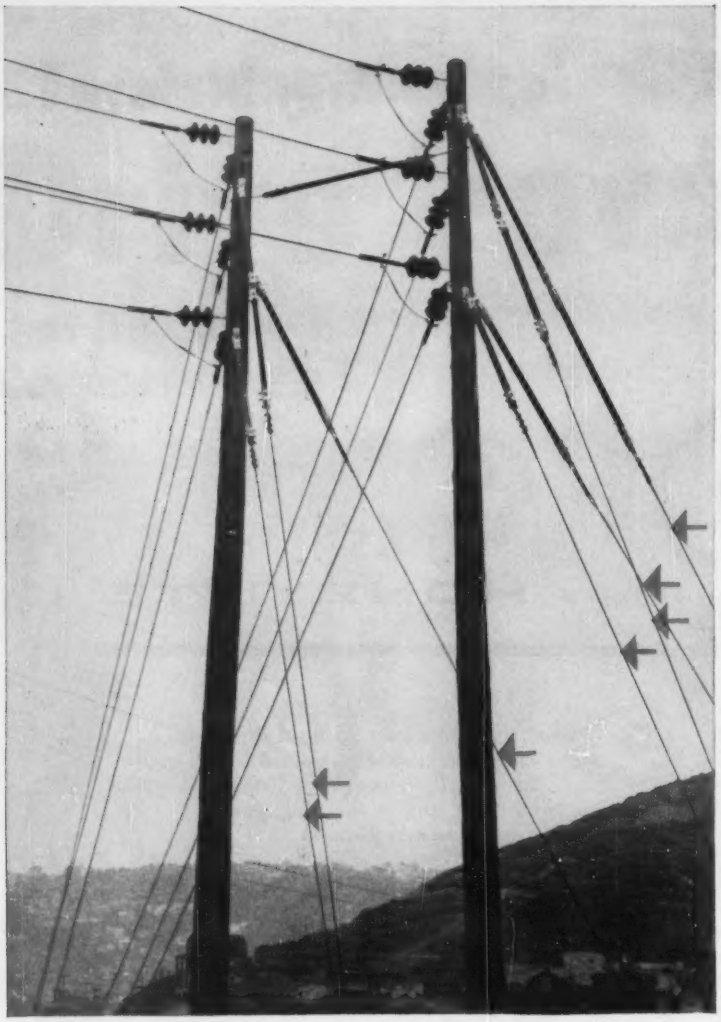
Fireproof Honeylite has underwriter's approval to be suspended under sprinkler systems; and its 45° shielding effect completely hides any ugly overhead utility installations.

Easy-to-maintain Honeylite is used in industrial or commercial interiors, in suspended louver-all ceilings or troffer diffusers.

Honeylite is truly the new lightweight champion! For price lists and detailed information see your local distributor or write to

HEXCEL PRODUCTS INC.

951-61st Street, Oakland 8, California



These "new" Copperweld Guys are 30 years old —and still going strong!

Installed 30 years ago, these Copperweld* Guys are as "new," safe, and strong today as the day they were put up—still good for many more years of dependable, maintenance-free service.

Unusual? Not for Copperweld. When it's up, it's up to stay—an advantage of vital importance to every operator of overhead lines.

Non-rusting Copperweld Strand, with its permanent high strength, matches pole life—eliminates guy repair and replacement costs. And, when you consider that the price of the guy strand is such a small part of the total installation cost, it's false economy to use anything but Copperweld—the best guy strand available.

*Trade Mark

non-rusting Copperweld GUY STRAND

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

***The Best** in Terms of Safety and Service!*

WHY....
"SPRING LOADED" FARGO HOT LINE CLAMPS are "STANDARD"

A heavy, vanadium steel spring compensates for conductor cold flow while under pressure and variables due to changing loads, fault currents and vibration.

"Vise Type" design with the two parts interlocking, increases the strength of the clamp (The clamp design follows the principle of the common bench vise).

Extra wide jaws increases conductor contact minimizing conductor cold flow by reducing the pressure per unit area. Larger heat radiating surfaces holds joint temperatures down. The wide jaws assure good electrical interconnection between strands because every strand of the rated conductors will be under at least one pressure zone.

Small conductors cannot be locked behind the jaws thereby eliminating the danger of a poor connection.

Completely enclosed greased threads are protected against weathering and may easily be loosened after long exposures.

Large "ears" or "lugs" assure a positive grip in all makes of hot sticks.

The thermal expansion of both jaws is equal as they are cast in "like" metals. In the aluminum or plated aluminum Fargo hot line clamps both jaws are aluminum and in the bronze clamp both jaws are bronze to assure uniform expansion when subjected to varying loads and temperatures.

Fargo hot line clamps are available in bronze, plated bronze, aluminum or plated aluminum to handle all combinations of conductors from 8 sol. to 397,500 ACSR plus rods.

The four sizes of the "AGE-Series" permit the most economical selection of clamps.

Ask your Line Material Field Engineer for complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

EMPIRE GUY STRAIN INSULATORS OF *Fiber Glass*

CHOICE OF THREE
IN STANDARD OR SPECIAL LENGTHS

#600 GLASS-STRAIN 11,000# MINIMUM BREAKING STRENGTH WITH TAPPED FITTINGS FOR UNIVERSAL ATTACHMENT

#703 GLASS-STRAIN 18,000# MINIMUM BREAKING STRENGTH

#800 GLASS-STRAIN 25,000# MINIMUM BREAKING STRENGTH

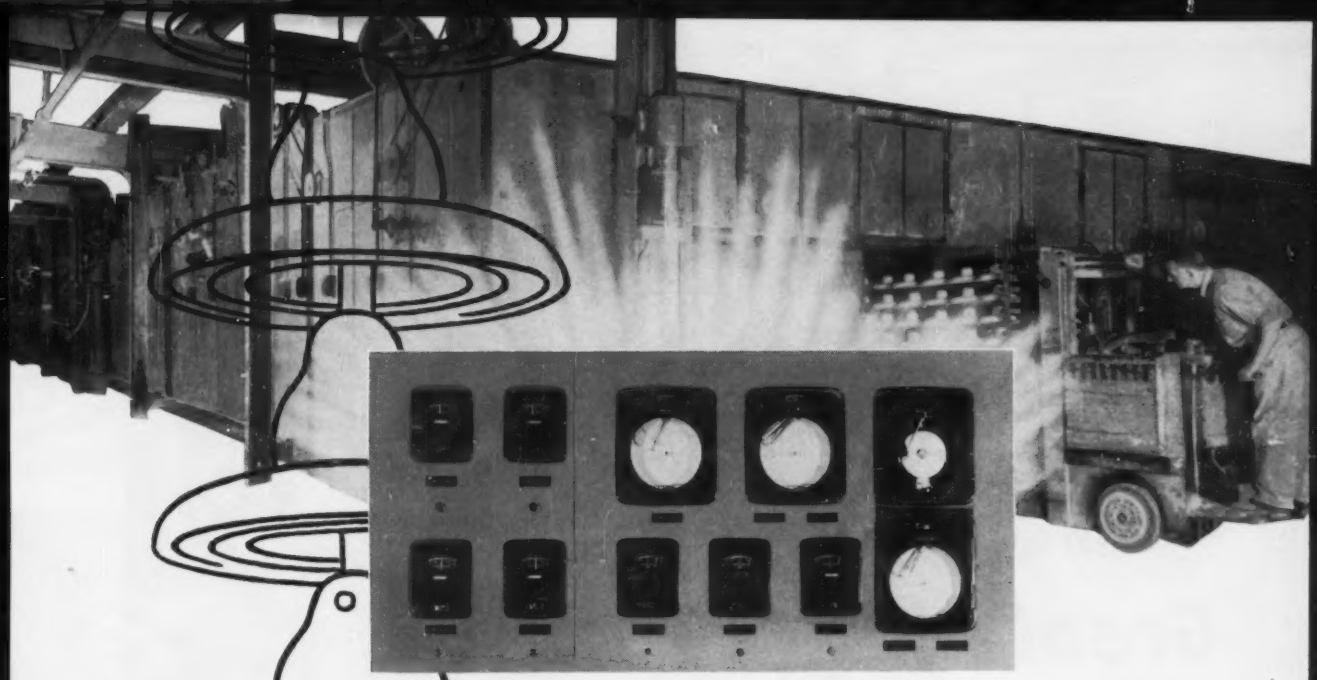
EMPIRE GLASS-STRAINS HAVE MET WITH ENTHUSIASTIC RESPONSE FROM POWER COMPANIES. NOW OTHER PRODUCTS UTILIZING THE EXCELLENT CHARACTERISTICS OF FIBER GLASS ARE AVAILABLE.

DOWN LEAD BRACKETS OF FIBER GLASS FOR SUPPORTING GROUND WIRE TO MAINTAIN EQUALIZED BASIC FLASHOVER VALUES OF THE THREE PHASES

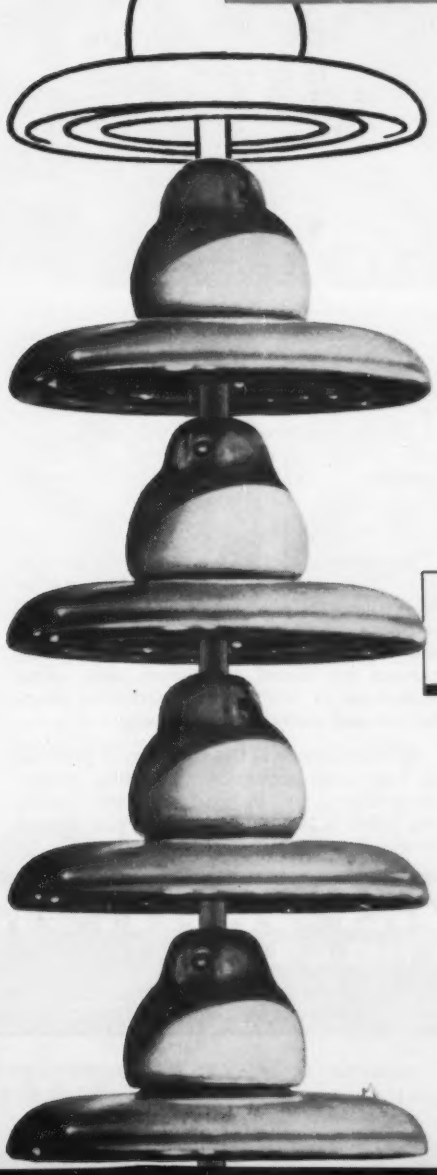
MIDSPAN SPACER BRACKETS OF FIBER GLASS PERMITTING INCREASED POLE SPACING AND MIDSPAN SERVICE DROPS.

Write for our new brochure and pamphlet with pictures of typical installations, production operations, testing equipment, detailed dimensional information and authentic notes. Names of sales representatives furnished upon request.

Empire Metal Products Co.
5443 WEST ROOSEVELT ROAD
CHICAGO 50, ILLINOIS



1¼ POUNDS OF WATER is removed from every Lapp suspension insulator disc between its forming and its firing. A tunnel drier 100 feet long, 10 feet high by 17 feet wide, can handle 6,804 suspension porcelains at a time. Its controls, pictured here, maintain a strict time-temperature-humidity cycle. Porcelains that go from this drier to the kiln are dried evenly through-and-through, without stresses, strains or cracks. And they are *uniform* porcelain-to-porcelain. Because of such controls at each step of manufacture, we can promise that *every* Lapp unit will give a high margin of operating security on your lines.



Lapp

LOW-COST TRANSMISSION INSULATION is assured by high performance and uniform long life of every Lapp suspension unit. In terms of mechanical strength and electrical permanence, these discs represent an outstanding value at their initial cost. Product of automation and control in manufacture, their characteristics are *uniform*. The saving grows and grows, through years and years of trouble-free service.

Lapp Insulator Co., Inc., Le Roy, N. Y.

for Faster Start-ups and Greater Economy

THIS 7,000 kW Brown Boveri Gas Turbine was installed in November, 1954 at the Vermilion, Alberta, Canada power station of Canadian Utilities, Ltd.

in PEAK LOAD and BASE LOAD SERVICE

BROWN BOVERI

single shaft, 7,000 kW, open cycle

GAS TURBINES

THE Brown Boveri 7,000 kW single shaft gas turbine is the answer to the rigid demands of Peak Load service. Relatively no warm-up time is required . . . full load can be reached in 15 minutes or less.

In-the-field performance records of over 50 such units—in peak and base load service throughout the world—prove their economy of operation. They require a minimum of manpower and maintenance; they burn any gaseous or liquid fuel; and they effect economies in building construction, foundations and overall capital outlay.

Whether yours is the problem of peaking or base load service in a public utility, cooperative, or industrial power plant, you'll find it profitable to investigate Brown Boveri Gas Turbines.

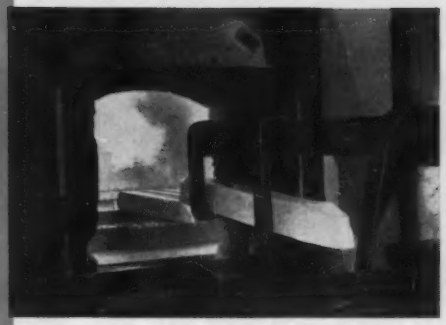
BROWN BOVERI

BROWN BOVERI CORPORATION

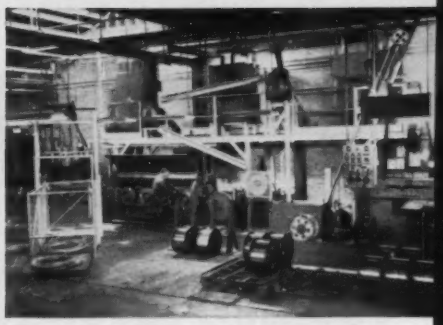
19 RECTOR STREET • NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Buffalo, N. Y. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo. • Detroit, Mich. Hamilton, O. • High Point, N. C. • Houston, Tex. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Miami, Fla. • Minneapolis, Minn. New Orleans, La. • New York, N. Y. • Pasadena, Cal. • Portland, Ore. • Roanoke, Va. • San Francisco, Cal. • Seattle, Wash. • Syracuse, N. Y. • Tucson, Ariz.

Short, short course on how top-quality building wire and cable is made—

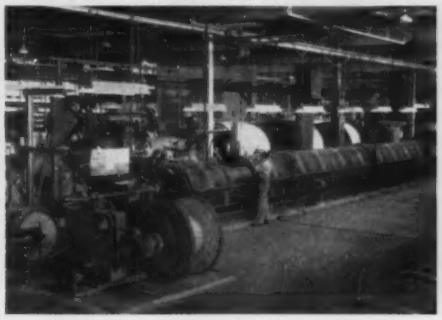


1. Electrolytic copper bars of the highest purity are heated to 1800°F.—then hot rolled into coils called "black rod." Quality control starts here, too, since rod must be thoroughly descaled before further processing.

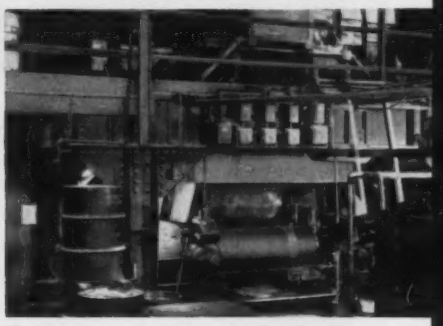


2. Next, copper rod is cold-drawn into wire of required size. The heavy screened enclosure above which feeds rod to drawing unit is a safety device conceived by Circle engineers and now widely used in the industry.

3. After final drawing, Circle wire is heat-treated in a process called "annealing." Electric furnaces under rigid atmospheric and thermal control restore the wire's original workability. Wire is now ready for tin coating.



4. Next step after tinning, with #6 AWG, or larger, is stranding. Above, an experienced operator runs one of Circle's modern units. This high speed machine assembles 12 individual wires in one operation.



5. Finally, wire is ready for insulation, most common being the rubber compounds. Mixing is done in a "Banbury" mixer shown above. Circle formulates and mixes its own compounds for maximum control.

6. After proper insulation is applied, wire may then be sent to the braiders for a mechanical protective covering. This may be a single or double cotton wrap saturated with a flame-retarding, moisture-resisting compound.

7. Circle wire and cable undergo many tests before shipment. Perhaps the most severe is this water test. An electric charge is introduced while coil is immersed in water. Any fault in insulation is immediately indicated by a Circuit Breaker.

These are only a few of the many operations involved in making all types of Circle top-quality building wire and cable. Add to this the constant testing and checking at every step along the way—and it can be seen that making wire is not as simple as it may seem.

One thing, however, is certain at Circle: whatever the product or processing method involved, there is never any relaxing of the rigid quality control necessary for producing the finest possible wire and cable. Circle Wire & Cable Corp., 5500 Maspeth Ave., Maspeth, L. I., N. Y.

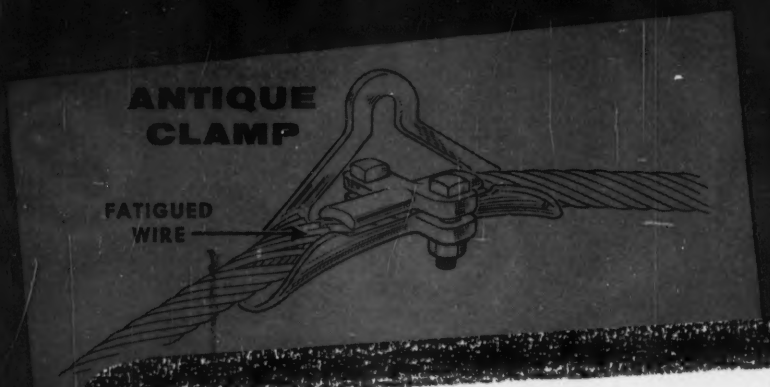
C W C **CIRCLE**

WIRE & CABLE
a subsidiary of
Cerro de Pasco Corporation

PLANTS: Maspeth and Hicksville, N.Y. **SALES OFFICES & WAREHOUSES:** Atlanta, Baltimore, Boston, Chicago, Cincinnati, Dallas, Des Moines, Detroit, Houston, Jacksonville, Los Angeles, Miami, Minneapolis, Nashville, New Orleans, Omaha, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Seattle, St. Louis. **ADDITIONAL SALES OFFICES:** Cleveland, Davenport, Ia., Newark, New Haven, New York, Utica.

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES • NEOPRENE SHEATHED CABLES

"PERFECTING...



not PERFECTION is our GOAL" *

"they both suspend the conductor BUT..."

... *yesterday's answers* are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—PREFORMED ARMOR RODS, introduced by Preformed Line Products Company in 1947.

Today's answer—PLP PREFORMED ARMOR with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations

Tomorrow's answer is here today: the Preformed armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

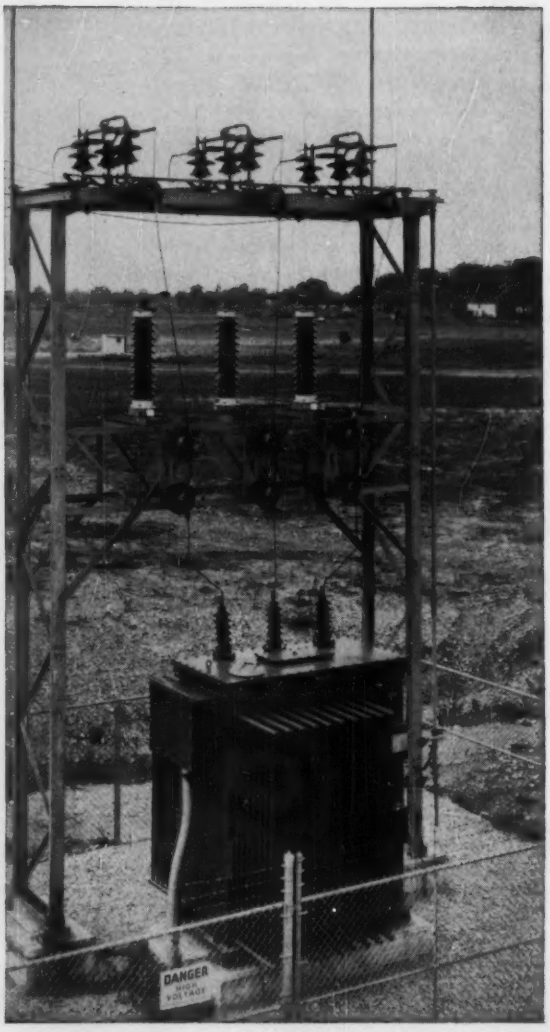
* *John Dewey, "The Reconstruction of Philosophy"*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PREFORMED LINE PRODUCTS COMPANY
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO
TELEPHONE: CLEVELAND EXPRESS 1-3571

for the new Sylvania Television Plant...

UPTEGRAFF



Three steps of power transformation in the new Sylvania Television Plant are supplied entirely by Uptegraff transformers. From the 2500 KVA power transformer shown at the left to the 120-volt lighting transformers shown on the page at the right, electric power is distributed by Uptegraff units.

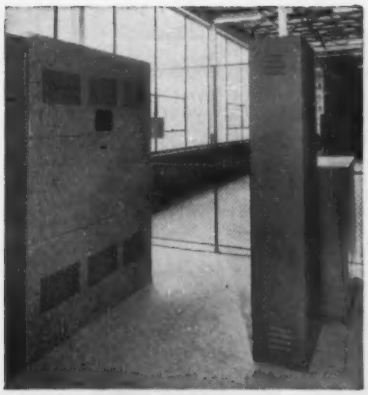
Located in Batavia, New York, this is one of the world's largest and most modern television plants. Advanced engineering practices are employed throughout, to provide the ultimate in production facilities. The selection of Uptegraff transformers for this vital function of providing all the electricity for power and lighting is a tribute to the high quality and dependability of this equipment.

The power transformer is liquid-filled, rated at 2500 KVA, 34,400-4160 volts. The distribution transformers are dry-type air-cooled units, rated at 750, 300, 225 and 112½ KVA. In all, seven Uptegraff transformers are in service in this plant.

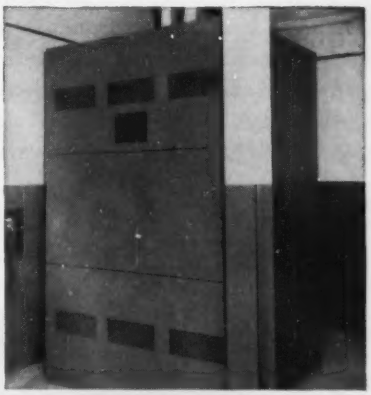
Uptegraff makes Power, Distribution, Instrument and Specialty transformers. Sizes are from 0.1 KVA to 10,000 KVA, 115 KV. Designed and built to meet or exceed all applicable NEMA, AIEE, ASA and other standards.

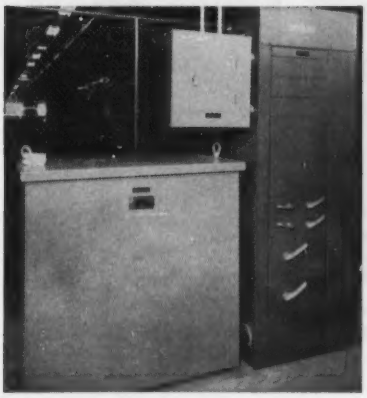
Electrical Contractor:
FERGUSON ELECTRIC CONSTRUCTION CO., Buffalo, N.Y.
Consulting Engineer:
J. FRUCHTBAUM, Buffalo, N.Y.
General Contractor:
JOHN W. COWPER CO., INC., Buffalo, N.Y

TRANSFORMERS throughout!



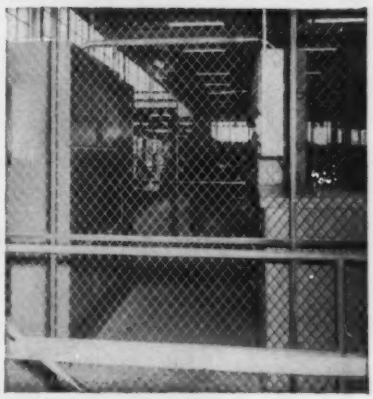
Shown here (left and right) are two of the four Uptegraff dry-type transformers used to provide both power and lighting current from the same distribution system, thus avoiding the duplication of units, common in the past. Two of the transformers are 750 KVA, and two are 300 KVA. All four are fed by 4160 volt circuits, and have 480Y/277 volt secondaries.





At the left is shown one of the Uptegraff dry-type transformers that provide 120-volt power. Two of these transformers are used, one being a 225 KVA unit, and the other 112½ KVA. Both have 480-volt primaries and 208Y/120 secondaries.

The photograph at the right shows how the dry-type Uptegraff transformers can be installed wherever desired, without vaults or other enclosures. This permits transformers to be safely located near the center of power usage, thus avoiding long costly runs of low-voltage circuits.



R. E. UPTEGRAFF MANUFACTURING CO. SCOTTDALE, PENNSYLVANIA

I-T-E CURRENT-LIMITING "CORDON" Circuit Breakers

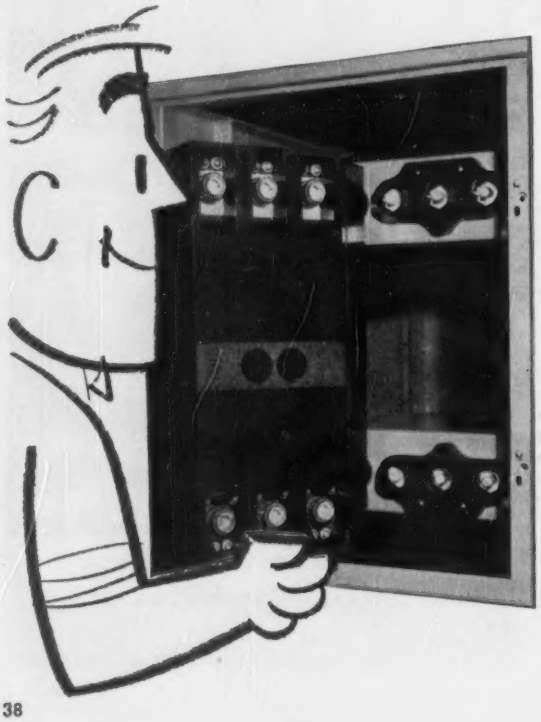
limit short circuit currents of high magnitude to a fraction of their possible value

"Cordon" Circuit Breakers combine current-limiting Amp-Traps* with standard thermal-magnetic molded case circuit breakers in a compact, integral design. They safely protect circuits where fault currents may reach 100,000 rms amperes, and also protect against sustained overloads and low magnitude short circuits. These current-limiting circuit breakers are now available as follows:

- A complete line—four frame sizes, 100, 225, 400 and 600 amp; 250 v d-c, 600 v a-c—with interrupting rating of 100,000 rms amperes
- With NEMA 1A and NEMA 12 enclosures
- With plug-in mounting for switchboard applications

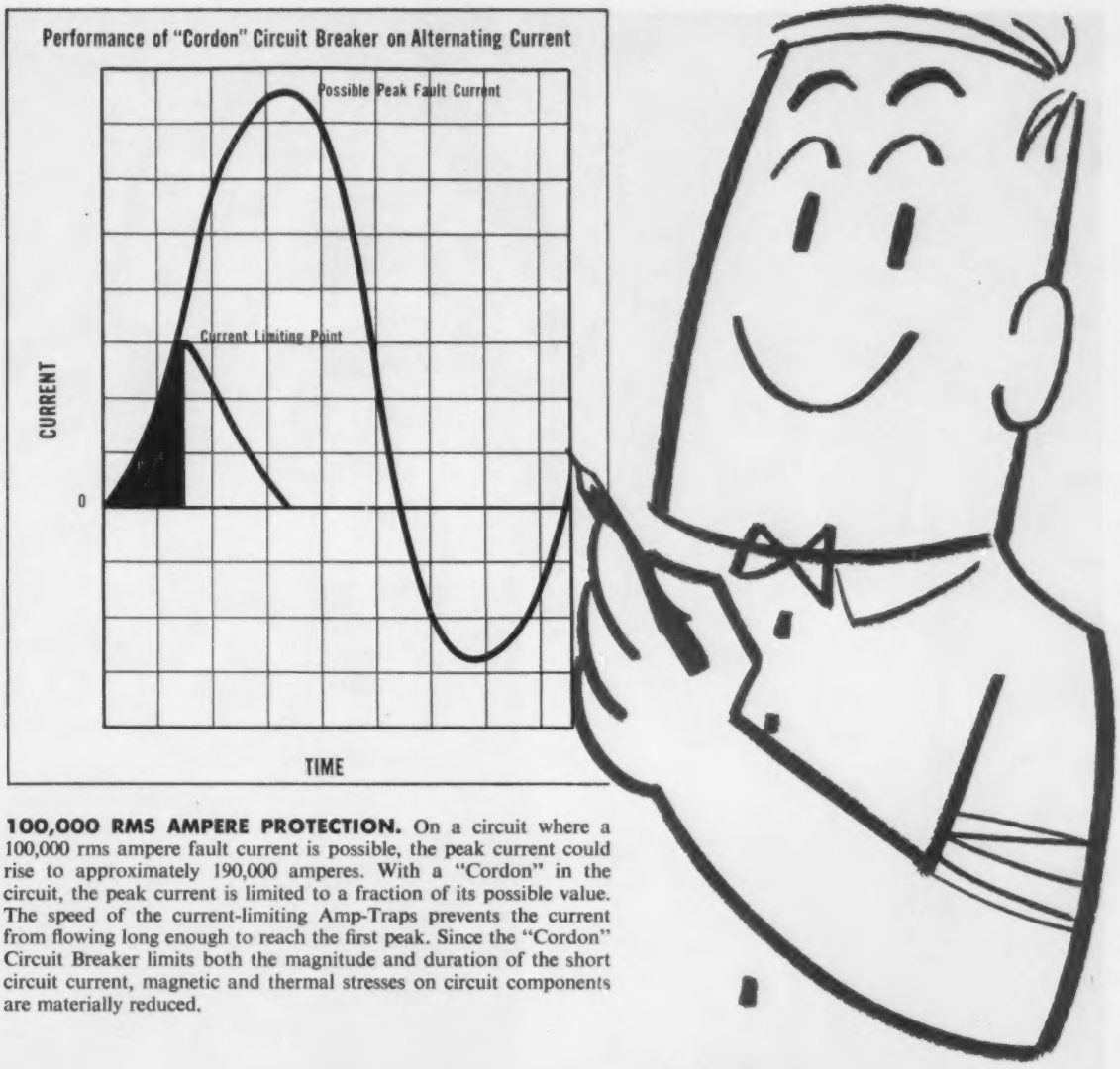
For complete information, contact your I-T-E representative. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Phila. 30, Pa.

**Amp-Trap is a registered trade-mark of the Chase-Shawmut Co.*

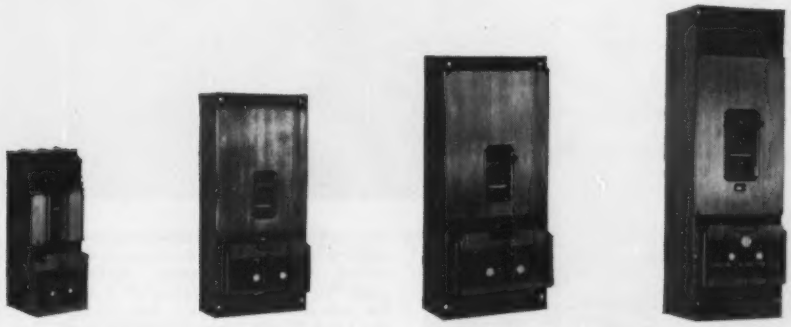


NEMA 1A AND NEMA 12 ENCLOSURES for housing "Cordon" Circuit Breakers are available.

FLEXIBILITY WITH PLUG-IN MOUNTING. Withdraw the breaker, insert another of the same frame size with the desired continuous ampere rating. No wiring changes. All "Cordon" Circuit Breakers can be supplied with plug-in mounting arrangement.



100,000 RMS AMPERE PROTECTION. On a circuit where a 100,000 rms ampere fault current is possible, the peak current could rise to approximately 190,000 amperes. With a "Cordon" in the circuit, the peak current is limited to a fraction of its possible value. The speed of the current-limiting Amp-Traps prevents the current from flowing long enough to reach the first peak. Since the "Cordon" Circuit Breaker limits both the magnitude and duration of the short circuit current, magnetic and thermal stresses on circuit components are materially reduced.

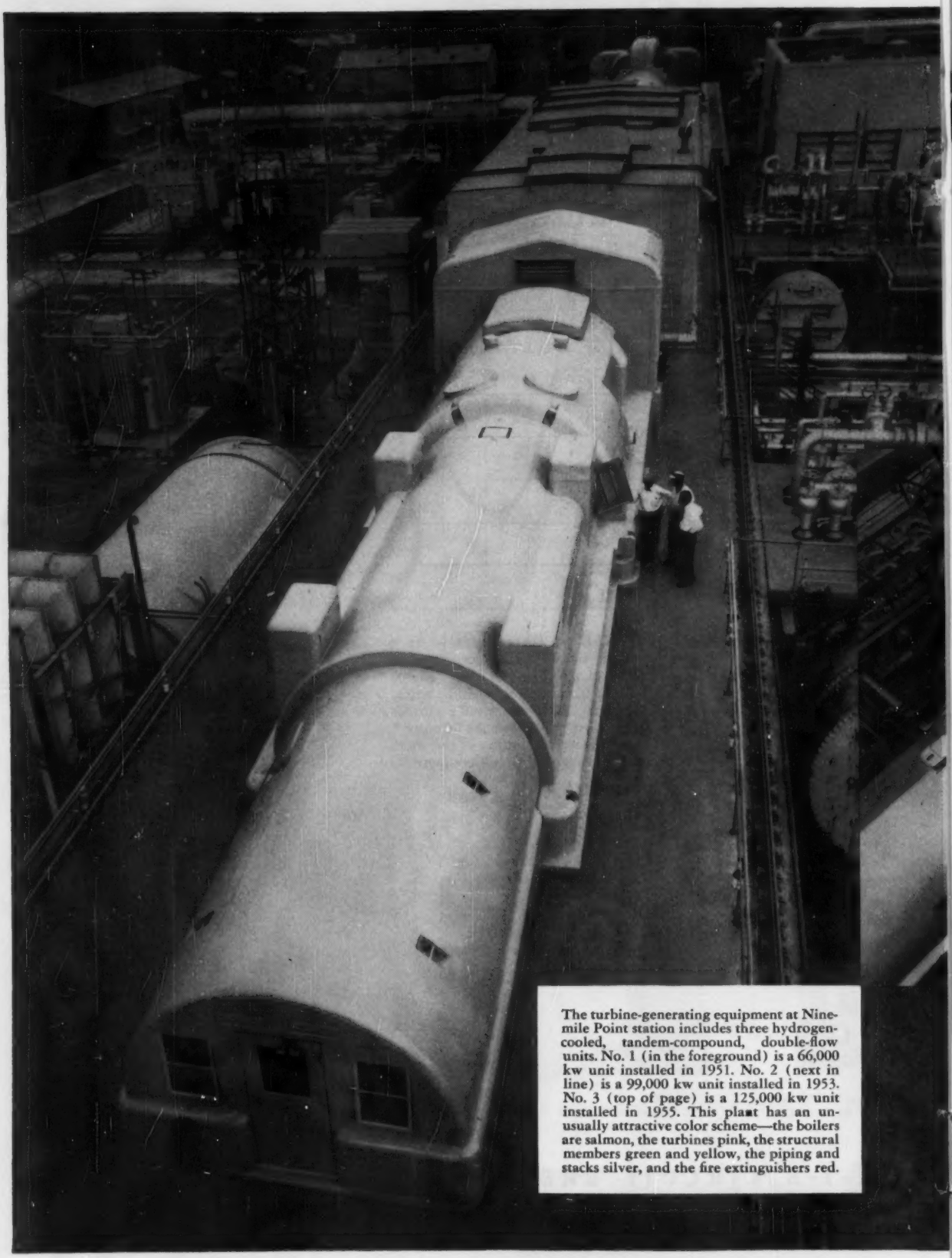


100 amp "CF" Frame | 225 amp "CK" Frame | 400 amp "CKL" Frame | 600 amp "CL" Frame

A COMPLETE LINE OF "CORDON" CIRCUIT BREAKERS from 15 to 600 amp, 250 v d-c, 600 v a-c

I-T-E CIRCUIT BREAKER COMPANY

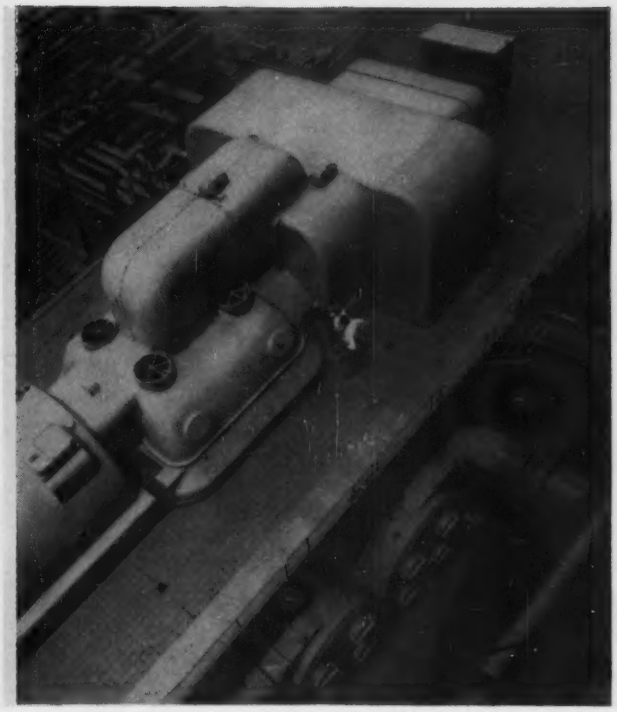
Small Air Circuit Breaker Division



The turbine-generating equipment at Nine-mile Point station includes three hydrogen-cooled, tandem-compound, double-flow units. No. 1 (in the foreground) is a 66,000 kw unit installed in 1951. No. 2 (next in line) is a 99,000 kw unit installed in 1953. No. 3 (top of page) is a 125,000 kw unit installed in 1955. This plant has an unusually attractive color scheme—the boilers are salmon, the turbines pink, the structural members green and yellow, the piping and stacks silver, and the fire extinguishers red.

Modern, efficient NINEMILE POINT plant uses the modern, efficient turbine oil:

GULFCREST



Close up of recently installed (1955) 125,000 kw turbine generator.

Pictured here are the turbine-generating units at the Ninemile Point station of Louisiana Power & Light Co., New Orleans, Louisiana, reported to be the most fully automatic utility power plant in the U.S.

For safe, sure, long-lasting protection of this key equipment, the lubrication is entrusted to Gulfcrest, the super-refined turbine oil.

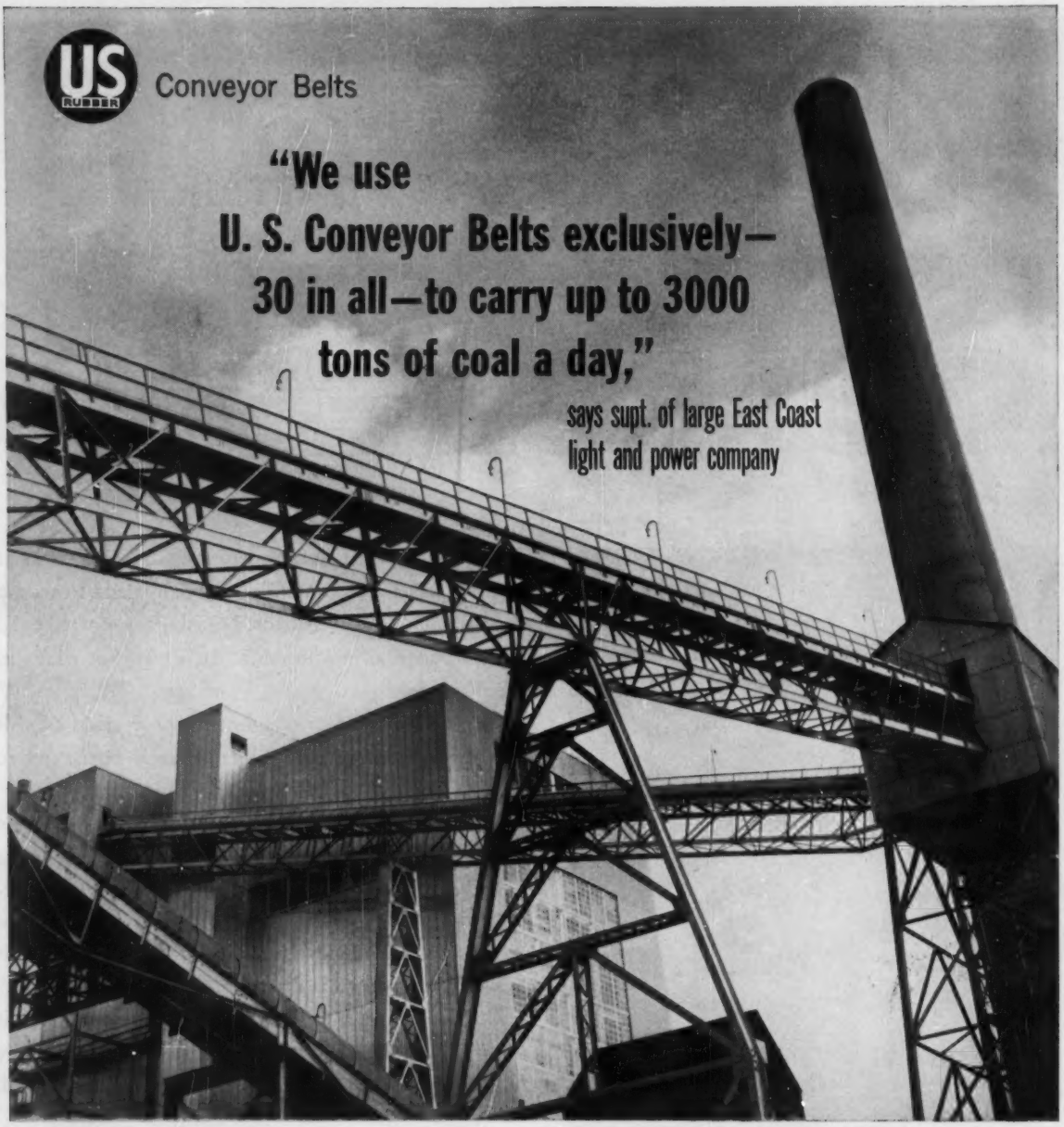
After the base stock for Gulfcrest has gone through the usual steps employed in refining other turbine oils, it is processed by an extra refining step—the exclusive Gulf Alchlor Process—which produces a pure and stable lubricant that delivers unmatched performance.

The next time you fill a turbine system, make it a fill for the finest, longest lasting protection by specifying Gulfcrest, the world's finest turbine oil. An experienced Gulf Sales Engineer will recommend the proper grade to meet your specific requirements.

Gulf Oil Corporation • Gulf Refining Company
1822 GULF BUILDING, PITTSBURGH 30, PA.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

GULF


US RUBBER
Conveyor Belts
"We use
U. S. Conveyor Belts exclusively—
30 in all—to carry up to 3000
tons of coal a day,"
says supt. of large East Coast
light and power company

The giant generating plant of this large New England light and power company, furnishes enough electric power for a city of 165,000 people. Thirty "U.S." Conveyor belts carry the 3000 tons of fuel in a round-the-clock operation.

"Our needs are constantly expanding," says the super, "and we intend to use 'U.S.' belts exclusively. Belting is the best way to carry coal... and the best belting is U.S. Rubber. Maintenance is usually confined to inspection and lubrication. We expect many years of service from these belts."

That's the story everywhere. High-volume operators are using "U.S." Belting, and the result is always *lower costs.* Like so many other successful belting installations, the system in this light and power plant is the result of United States Rubber's "Three-Way Engineering"—in which "U.S." engineers work with the engineers of the conveyor builders and engineers of the power company to turn out the best belt conveyor system for the specific job.

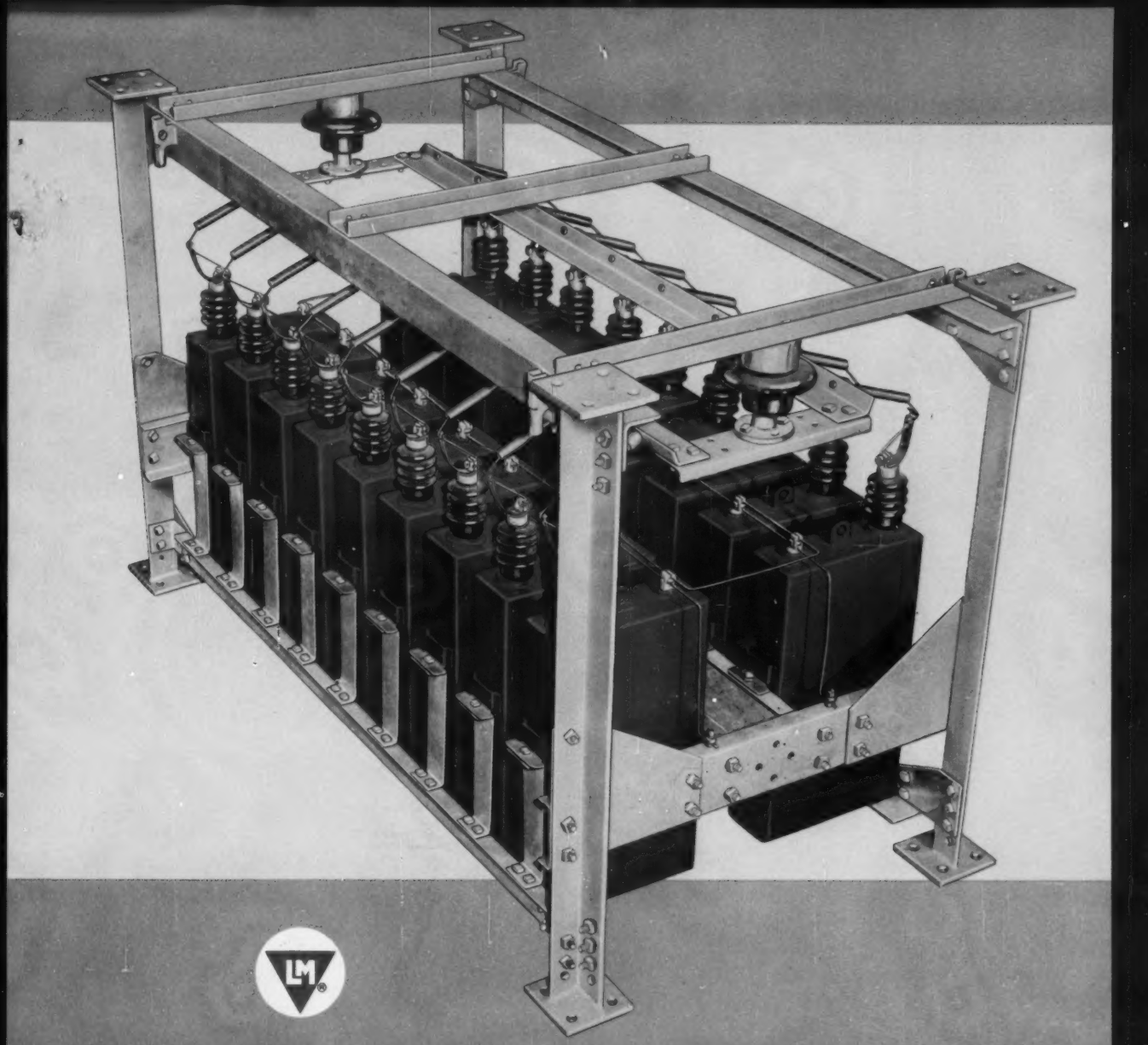
U. S. Rubber Conveyor Belts and expert engineering assistance are available at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N.Y.

Watch NCAA football, Saturday afternoons. NBC-TV

US RUBBER

Mechanical Goods Division

United States Rubber



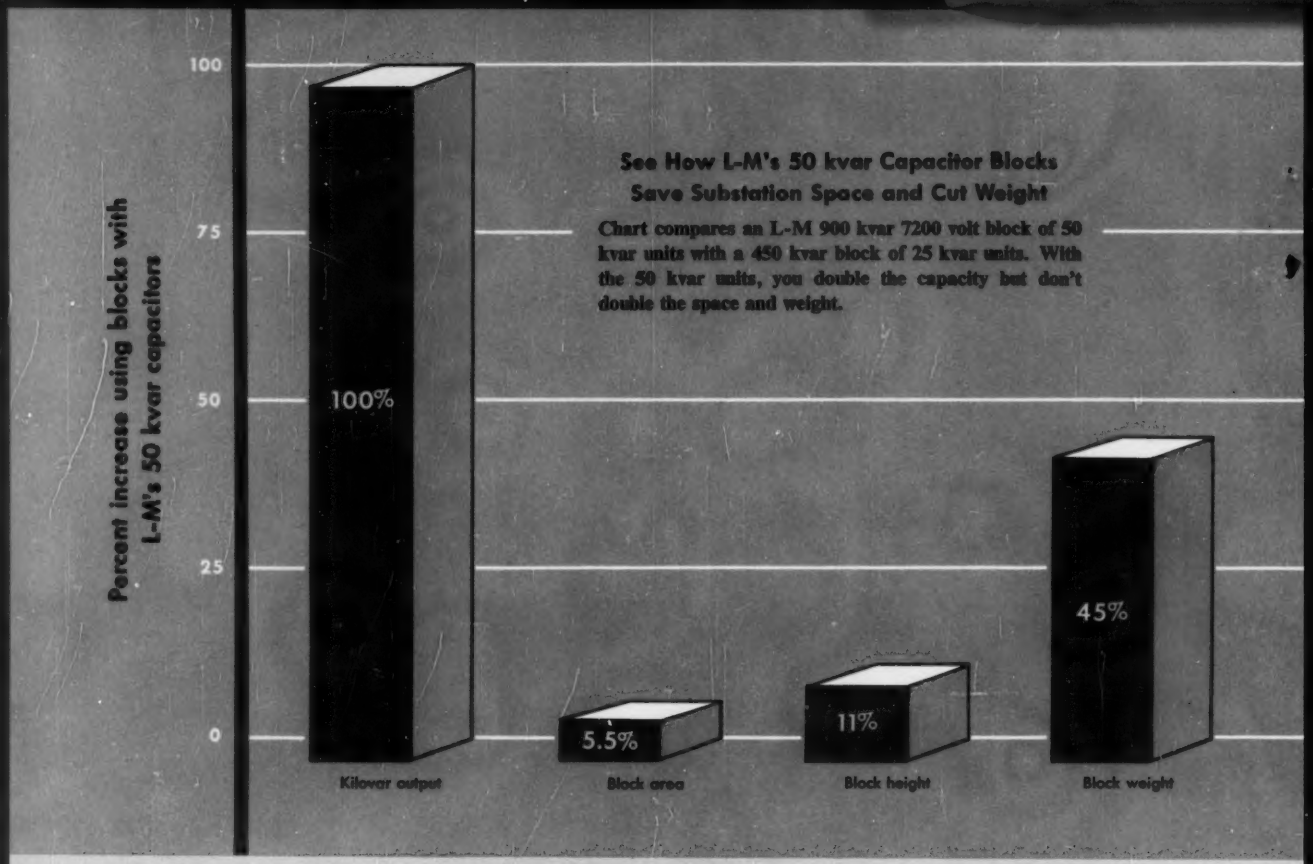
L-M's New 50 Kvar Capacitor Blocks

Save Space, Cut Costs

LINE MATERIAL Elemex® Capacitors

A McGRAW ELECTRIC COMPANY DIVISION

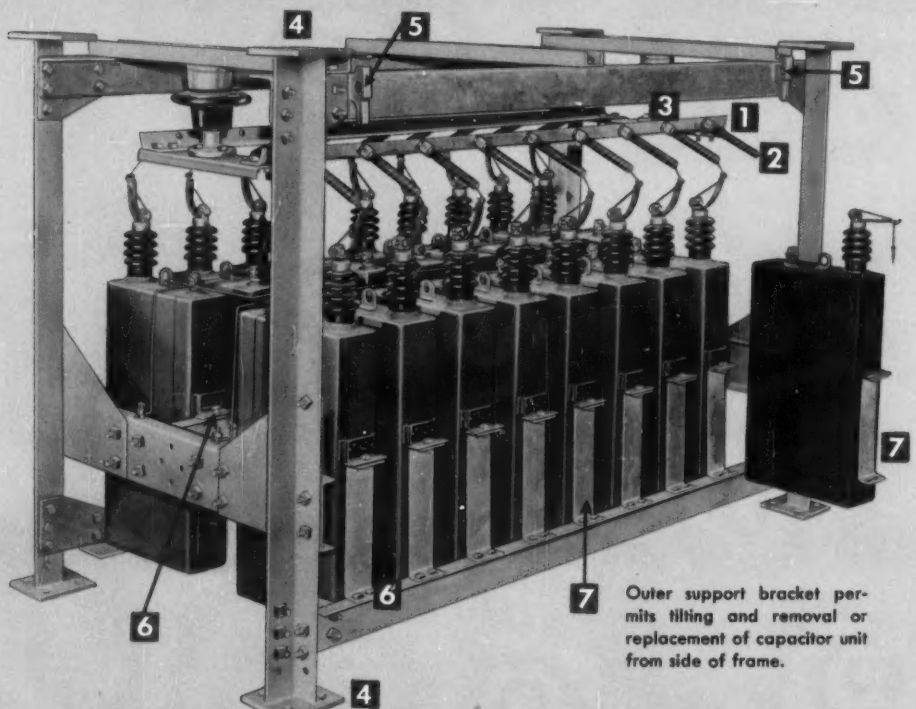
see details ▶



See How L-M's 50 kvar Capacitor Blocks Save Substation Space and Cut Weight

Chart compares an L-M 900 kvar 7200 volt block of 50 kvar units with a 450 kvar block of 25 kvar units. With the 50 kvar units, you double the capacity but don't double the space and weight.

1. Aluminum-alloy bus
2. Bus-mounted fuses
3. Bus connections wire brushed and treated with oxidation inhibitor.
4. Jig-assembled for perfect alignment of mounting pad bolt holes.
5. Lifting lugs.
6. Tapped holes in frame for capacitor mounting bolts. Nuts not needed.

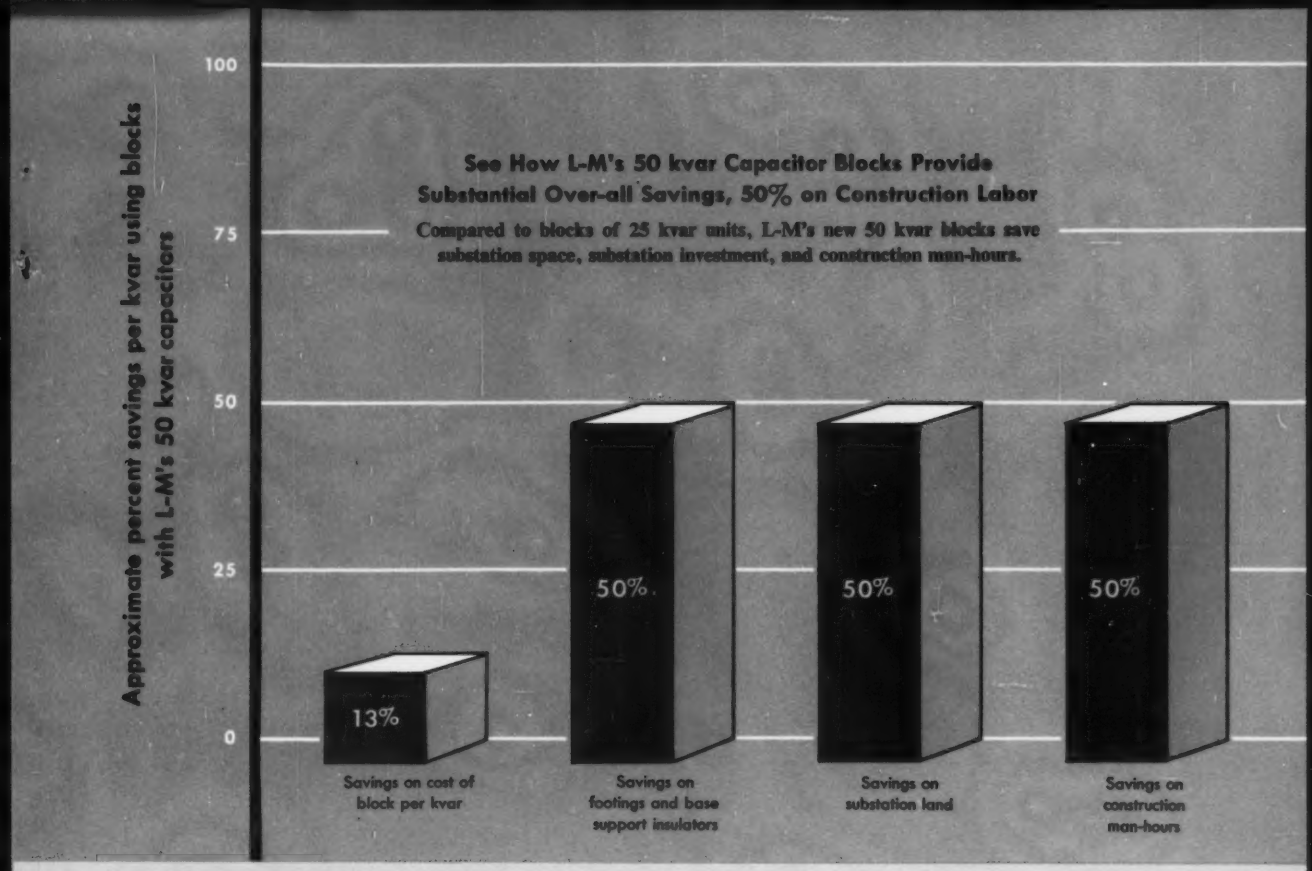


Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION


See How L-M's 50 kvar Capacitor Blocks Provide Substantial Over-all Savings, 50% on Construction Labor
Compared to blocks of 25 kvar units, L-M's new 50 kvar blocks save substation space, substation investment, and construction man-hours.
Approximate percent savings per kvar using blocks with L-M's 50 kvar capacitors
100
75
50
25
0
13%
50%
50%
50%
Savings on cost of block per kvar
Savings on footings and base support insulators
Savings on substation land
Savings on construction man-hours

Another L-M First...

L-M's New 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Company

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA Standard 50 kvar capacitor equipments. Prompt delivery now on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Company, Milwaukee 1, Wis.

Elemex® Capacitors

more ▶

L-M Offers Application Engineering Service

L-M's service includes design of protective and control schemes for single- and multi-step banks, and complete capacitor equipments.

Line Material development engineers are experienced in the design and application of any size or type of capacitor bank for operation at transmission or distribution voltages. L-M will supply information on protective and control schemes, and will cooperate with utility company engineers to assure the best capacitor bank designs.

Single- or Multi-Step Switching

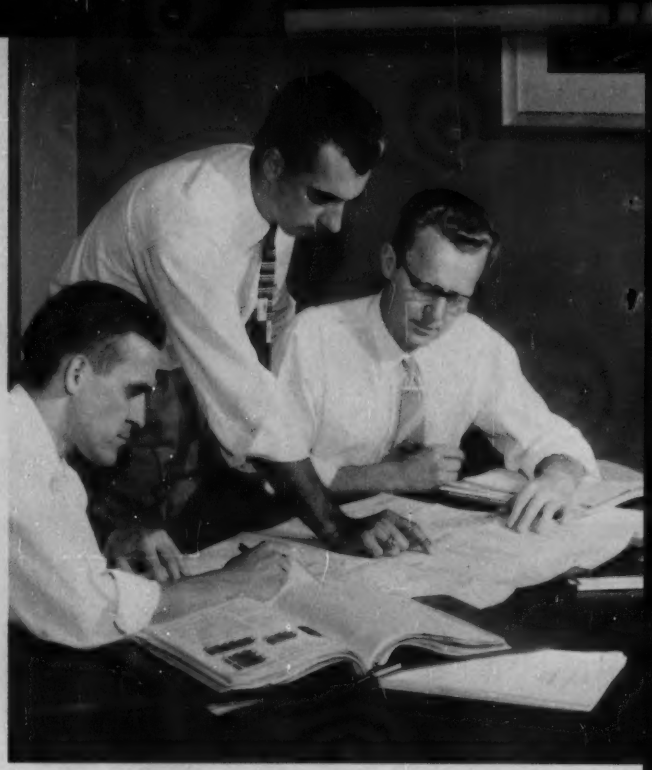
Careful consideration is given to both electrical and economic factors in the selection of single- or multi-step capacitor banks. These factors include fault-current and over-voltage relationships, number of units in parallel for any series group, step-switching sequences, grounded or ungrounded neutrals, and capacitor switch limitations.

Protective Schemes

L-M development engineers will recommend link sizes for fusing individual units and for capacitor bank group fusing; also current, voltage and time-delay relay schemes and alarm circuits as required.

Control Schemes

L-M will design voltage, current, time, kilovar, or temperature sensitive control schemes or any combination to best fit your system.



L-M engineers will cooperate with you in working out the most satisfactory capacitor application designs.

Other Line Material Capacitor Equipments

L-M's complete line of capacitor equipments includes pole-mounted 25- and 50-kvar capacitor racks—pole-mounted secondary capacitors—submersible secondary capacitors.

All Line Material capacitors incorporate outstanding product features such as aluminum metallic coating under a primer and finish coat of alkyd resin paint, strong solder-sealed bushings, and low-temperature Elemex liquid dielectric.

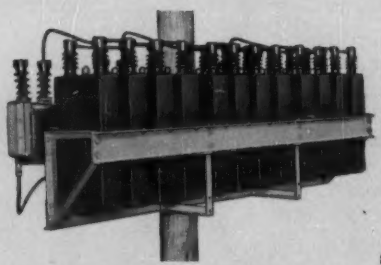
25 and 50 kvar Capacitor Racks

L-M's pole-mounted capacitor racks are factory-assembled and wired, ready to install on distribution systems rated 2400 to 13,800 volts. New 50 kvar racks are available up to 450 kvar switched and 600 kvar unswitched multi-row racks; up to 600 kvar switched or unswitched single-row racks.

New 50 kvar racks have less weight and require less space on the pole per kvar compared to 25 kvar racks. A 600 kvar 7200 volt switched single-row rack weighs only 31% more than a 300 kvar rack with 25 kvar units.

Pole-Mounted Secondary Capacitors

L-M's 240 volt secondary capacitors are available in 3, 5, and 7½ kvar. The units are small, light, and rugged; easy to install on crossarm or direct pole mounting. Shipping carton permits inspection and testing without removing capacitors from the carton.



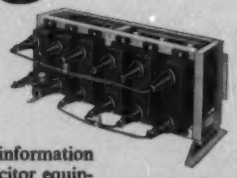
L-M's new 50 kvar capacitors in 600 kvar switched pre-wired pole-mounted rack.

Submersible Secondary Capacitors

L-M's new 216 volt, 13⅓ kvar submersible capacitors are available in 40, 80, and 120 kvar racks, entirely assembled at the factory and ready for installation. Racks are designed for a minimum space requirement and can be passed through a 30-inch diameter manhole.

3, 5, and 7½ kvar 240 volt secondary capacitors. 10 kvar units will be available soon.

Height 13¾" 3 kvar
18⅝" 5 kvar
23½" 7½ kvar

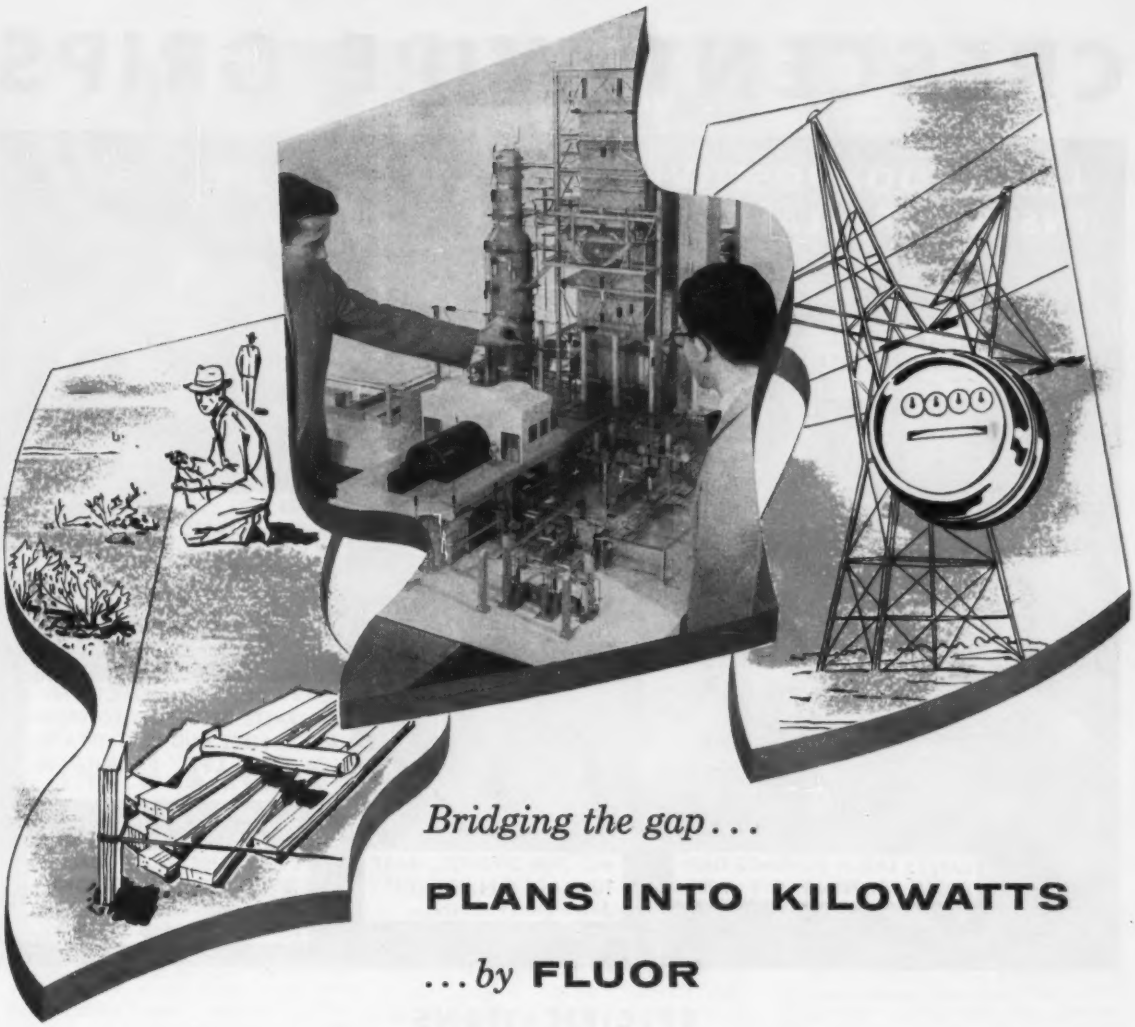


80 kvar submersible secondary capacitor equipment

Get More Information—Ask your L-M Field Engineer for information on features, design and delivery on L-M's complete line of capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin.

LINE MATERIAL *Elemex®* **Capacitors**

A McGRAW ELECTRIC COMPANY DIVISION



Bridging the gap . . .

PLANS INTO KILOWATTS

. . . by **FLUOR**

A study of America's growing economy shows why the electric power industry is building toward an estimated generating capacity of 2 billion kilowatts within the next 40 years.

For these new facilities, the power industry has found that it can look to the Power Engineering Department of The Fluor Corporation, Ltd. for plants characterized by early completion, construction within estimates and consistently high efficiencies. At Fluor, one of the best balanced, experienced engineering and construction staffs available in industry today stands ready to design and build plants of any kilowatt rating and any basic design: from conventional steam turbine to nuclear reactor. Modern methods . . . . symbolized by the detailed engineering model shown above (that of a steam-turbine unit) and the broad background of a permanent staff serving *many* industries . . . . combine to prove that in electric power, too, "you can be *sure* with Fluor."

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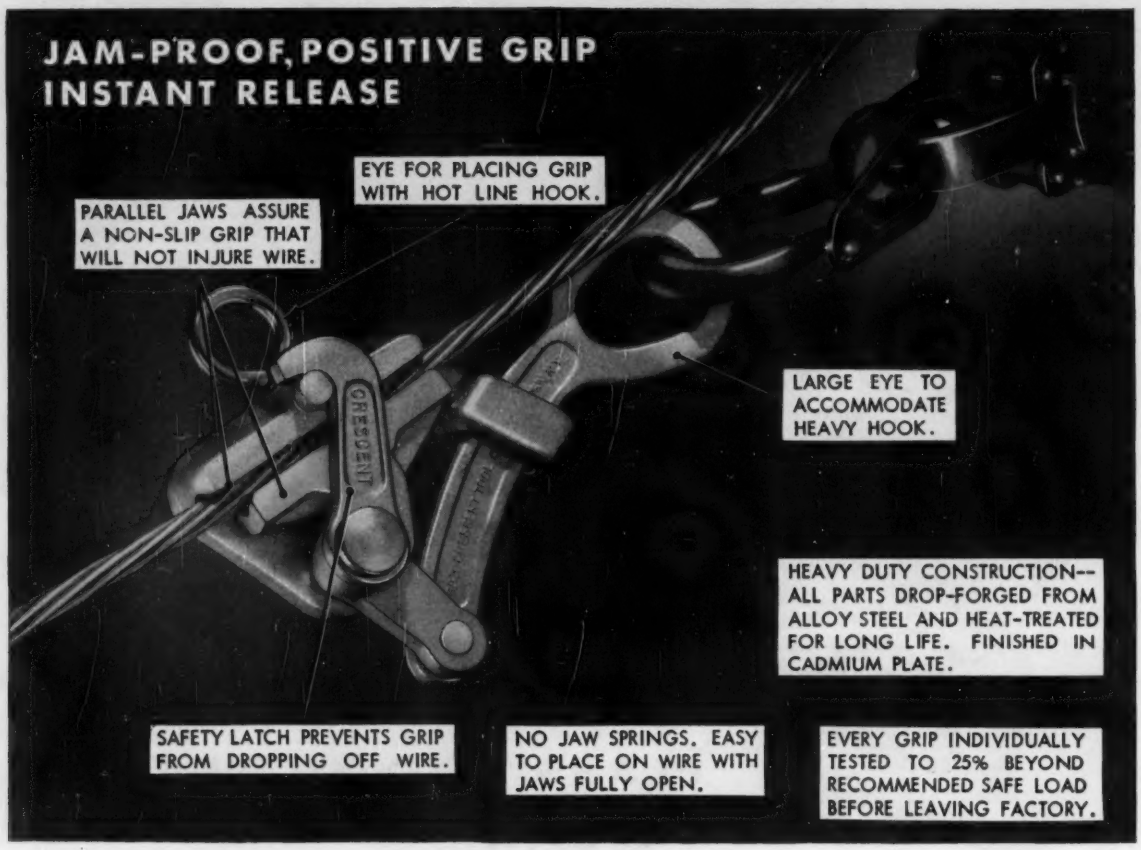
CRESCENT WIRE GRIPS


JAM-PROOF, POSITIVE GRIP
INSTANT RELEASE
EYE FOR PLACING GRIP WITH HOT LINE HOOK.
PARALLEL JAWS ASSURE A NON-SLIP GRIP THAT WILL NOT INJURE WIRE.
LARGE EYE TO ACCOMMODATE HEAVY HOOK.
HEAVY DUTY CONSTRUCTION-- ALL PARTS DROP-FORGED FROM ALLOY STEEL AND HEAT-TREATED FOR LONG LIFE. FINISHED IN CADMIUM PLATE.
SAFETY LATCH PREVENTS GRIP FROM DROPPING OFF WIRE.
NO JAW SPRINGS. EASY TO PLACE ON WIRE WITH JAWS FULLY OPEN.
EVERY GRIP INDIVIDUALLY TESTED TO 25% BEYOND RECOMMENDED SAFE LOAD BEFORE LEAVING FACTORY.

SPECIFICATIONS

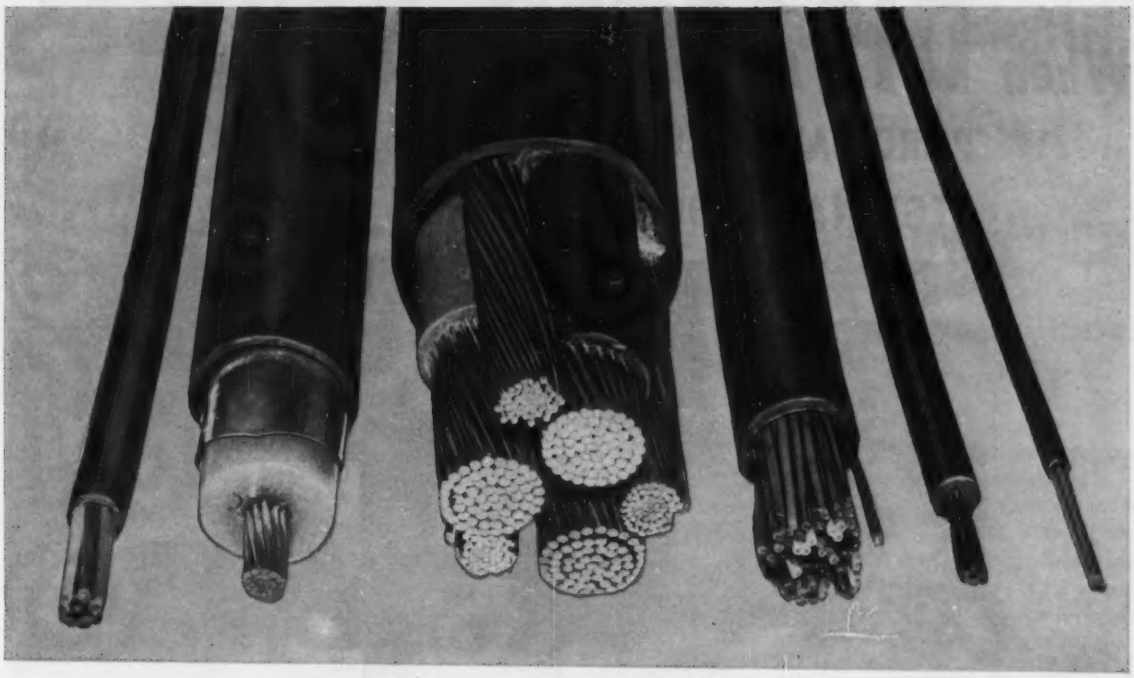
Number	*Maximum Capacity*	*Minimum Capacity*	*Safe Load*	*Eye Opening*	*Weight*
383 —Serrated Jaws	5/16 (.3125)" 8 mm.	—5/32 (.156)" 4 mm.	5,000 lbs. (2200 KG)	1-1/8" x 1-11/16"	1-3/4 lbs.
383-2—Same, except with smooth jaws for aluminum wire.					
384 —Serrated Jaws	1/2 (.500)" 12.2 mm.	—1/4 (.250)" 6.5 mm.	7,500 lbs. (3400 KG)	1-1/4" x 1-3/4"	3-5/16 lbs.
384-2—Same, except with smooth jaws for aluminum wire.					
385 —Serrated Jaws	3/4 (.750)" 19 mm.	—3/8 (.375)" 9.5 mm.	10,000 lbs. (4500 KG)	1-1/4" x 1-3/4"	4-7/8 lbs.
385-2—Same, except with smooth jaws for aluminum wire.					
386 —Serrated Jaws	1-1/16 (1.0625)" 27 mm.	—9/16 (.5625)" 14.5 mm.	12,500 lbs. (5600 KG)	1-5/8" x 2-3/8"	9 lbs.
386-2—Same, except with smooth jaws for aluminum wire.					

For bare and insulated wire, use serrated jaw style. For bare aluminum wire only, smooth jaws.

Write for Crescent Catalog No. 28 which illustrates and describes many valuable tools for linemen and other electrical workers.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



There is an ALATHON® polyethylene resin for your specific insulating and jacketing need

ALATHON polyethylene resins are outstanding in the field of electrical insulating and jacketing materials. Not only are the inherent properties of ALATHON suited for wire and cable insulation, but a number of compositions have been developed for specific applications. Performance in these specific uses has been improved by basic changes in the molecular structure and by advances in compounding with improved stabilizers and other ingredients.

ALATHON polyethylene resins offer low power loss and dielectric constant, toughness and flexibility even at extremely low temperatures, and high moisture resistance. ALATHON has particularly outstanding thermal and mechanical properties.

ALATHON 4, BK-20 (black) offers exceptional outdoor durability and resistance to environmental stress cracking. It is protected from ultraviolet light by fine channel black, intimately dispersed, and has excellent low-temperature toughness, contributed by the high molecular weight of the composition.

ALATHON 5, NC-10 (natural) and ALATHON 5B, NC-10 (colorless) are unpigmented and offer the best electrical properties. The low power factor and dielectric constant of these resins remain essentially unchanged over the entire range of frequencies measured to date, and over a wide range of temperatures.

ALATHON 5, BN-07 (brown) is specially compounded to give a measure of weather resistance without sacrificing low dielectric loss characteristics.

ALATHON 5, BK-21 (black) is protected from ultraviolet light by fine channel black. It has good loss characteristics for material containing carbon.

ALATHON 5, BK-22 (black) is similar to ALATHON 5, BK-21, but contains more carbon black for greater weather resistance.

ALATHON 6, NC-10 is a foamable polyethylene composition that forms a cellular wire coating with fine, discrete pores. Because of the presence of the inert gas, the dielectric constant is even lower than that of solid polyethylene.

RULAN is based on polyethylene resin compounded to give flame-retardant qualities with good electrical properties. RULAN passes the Underwriter Laboratories vertical flame test.

Du Pont has prepared property and application data that will help you choose the composition of ALATHON which will work best in your specific application. To get this complete information, simply clip and mail coupon.

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polyethylene resin

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Please send me complete information on Du Pont ALATHON polyethylene resins. I am interested in evaluating these materials for

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We all remember the costly damage caused by hurricanes Carol, Edna, Hazel and others in the past. Electrical installations and power were knocked out over a widespread area.

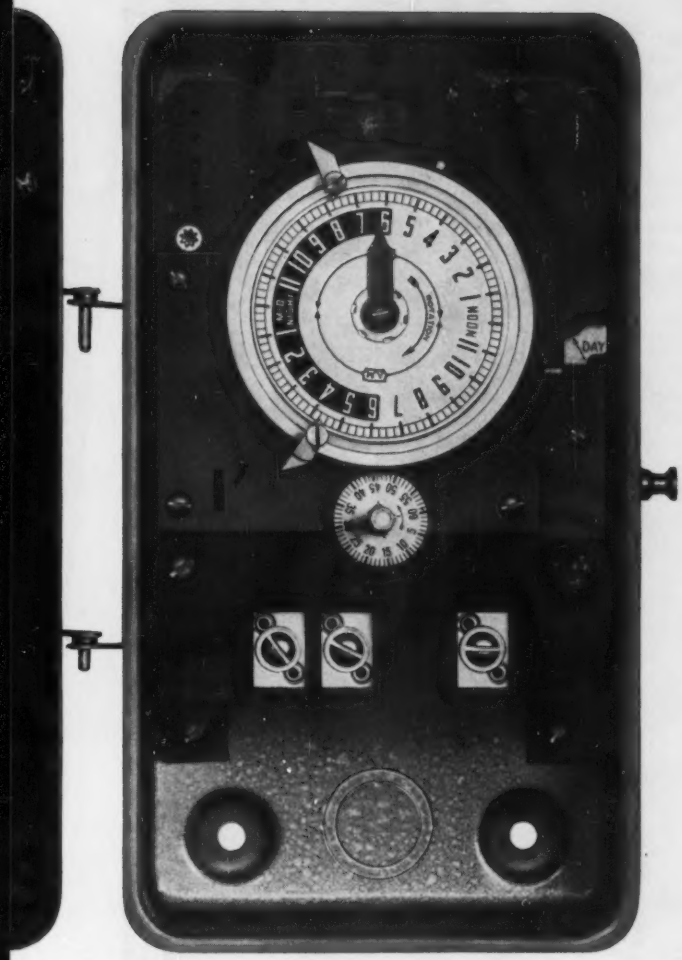
THE HURRICANES TO COME *(Carla, Dora, etc.)* ARE APT TO BE AS COSTLY!

Vital areas dependent on uninterrupted power demand swift and effective action in cases of power failures. Procurement of vitally needed insulators and other materials must always be within immediate reach for emergency repair.

PORCELAIN PRODUCTS' 20 strategically located regional stocks covering all sections of the United States are in complete readiness for any disaster. Their purpose is to serve YOU-to facilitate your prompt and efficient restoration of electrical power failures in any event.
You can depend on PORCELAIN PRODUCTS.

PP INC.

Porcelain Products, Inc.
High Voltage Division — **Parkersburg, W. Va.**



New General Electric TSA-40 Time Switch At a New Low Price

Now you can get reliability at low cost for any ON-OFF job

The TSA-40 is a completely new heavy duty time switch engineered by General Electric to give you more reliable on-off operation at a lower price.

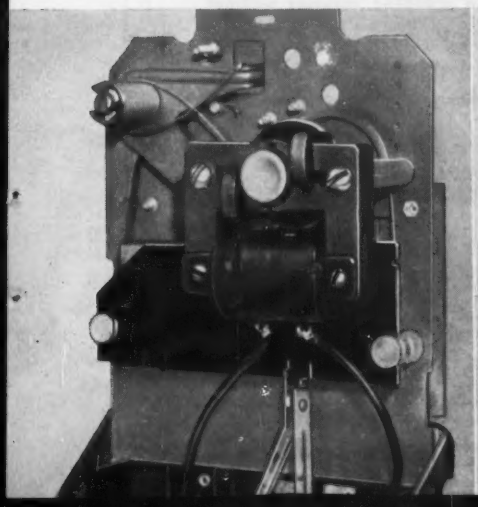
HIGH RELIABILITY of the G-E TSA-40 time switch is made possible by the exclusive contact shearing action, the one-piece terminals and contact blades, and the time-proven Telechron* motor. Now with weatherproof case, the TSA-40 is fully suitable for all types of ON-OFF applications, indoor and outdoor, in temperatures from −50 F to 150 F.

LOW COST means you get this reliability in the TSA-40 at prices starting as low as $22.70**. Not only this, but highly dependable operation means minimum attention, and you save money on maintenance. For off-the-shelf delivery contact your local General Electric time switch distributor or the G-E Apparatus Sales Office nearest you today. Or write for free bulletin to Section 584-5, General Electric Co., Schenectady 5, N. Y.

*Reg. trademark of General Electric Co.
**Manufacturer's suggested resale price for standard SPST model.

GENERAL ELECTRIC

GREATER TEMPERATURE RANGE of −50 F to 150 F is made possible by improved Telechron* motor. Direct drive of switching mechanism assures positive action.



COMPLETELY WEATHERPROOF steel case has press-fit latch for tight seal and easy opening. Side-hinged removable cover simplifies installation and maintenance.

NO WIRING BURNOUTS or "hot spots" because one-piece contact and terminal assembly eliminates all internal wiring to contacts. Unit terminal block makes replacement easy.

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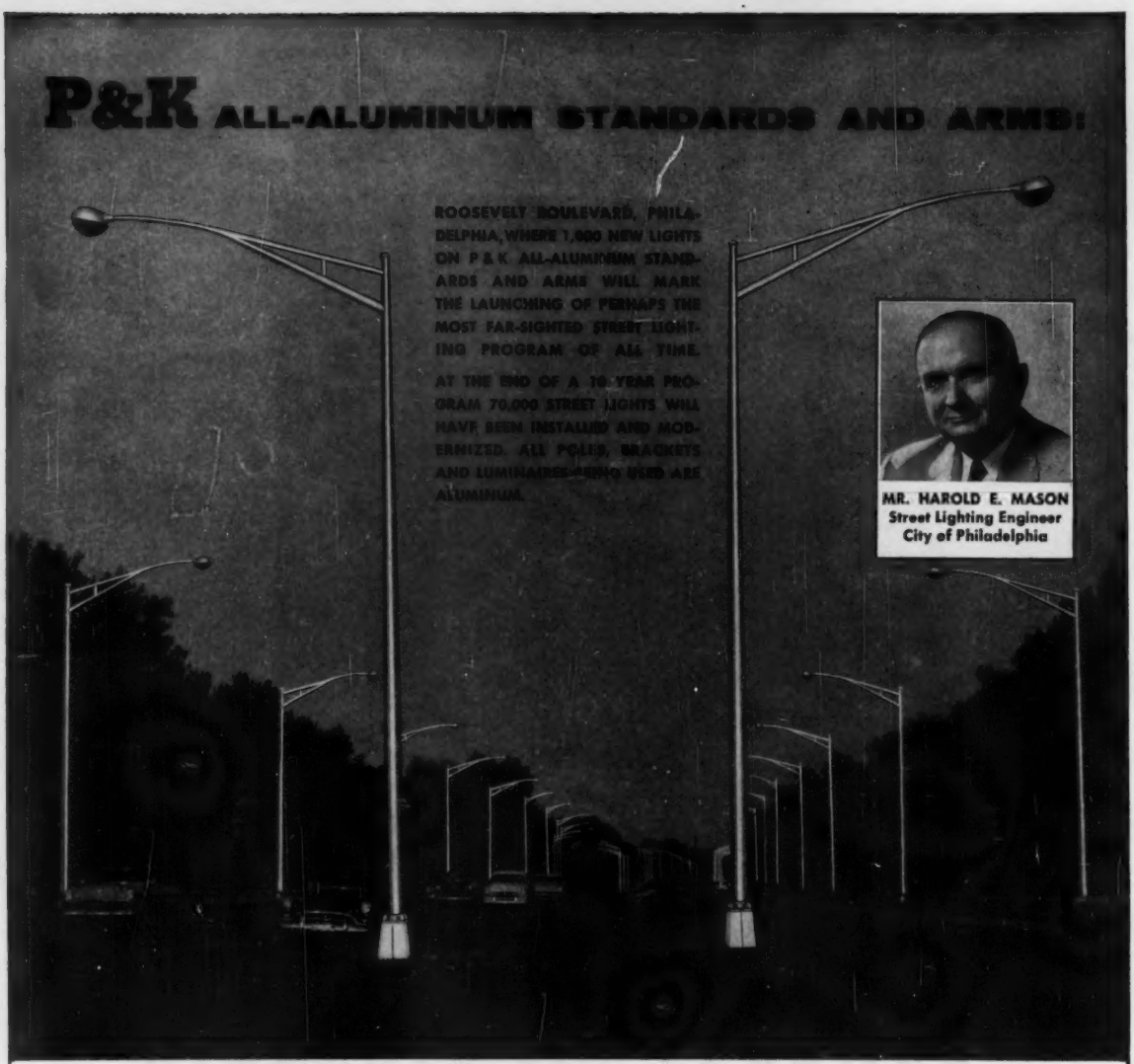
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AT THE END OF A 10-YEAR PROGRAM 70,000 STREET LIGHTS WILL HAVE BEEN INSTALLED AND MODERNIZED. ALL POLES, BRACKETS AND LUMINAIRES USED ARE ALUMINUM.

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Like their 500 P & K predecessors installed in the "World's Workshop" years ago, these new P & K 32-ft. All-Aluminum Standards, and P & K 12-ft. Tapered Elliptical Arms will prove *the wisest investment in modern lighting.*

LIGHT-WEIGHT, HIGH STRENGTH, AND CORROSION-FREE FOR EASY INSTALLATION AND LONGEST LIFE.

NO NEED FOR PROTECTIVE MAINTENANCE, NEVER NEED PAINTING.

NO SEAMS, NO FRILLS, NO SCROLLS, NO TIE-RODS. ITS MODERN SIMPLICITY IS CONTEMPORARY TODAY OR TWENTY YEARS FROM TODAY.

PROVES MUCH LOWER IN COST OVER THE YEARS.

Write for latest P & K catalog . . . and use the P & K advisory and planning services without obligation.

Pfaff & Kendall
84 Foundry Street
Newark 5, New Jersey

MEMORANDUM

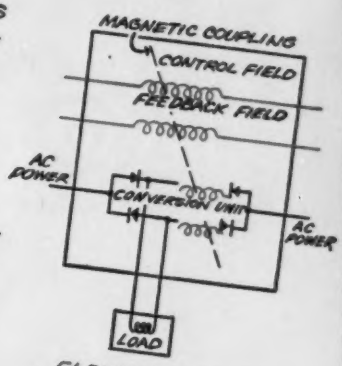
FROM: THE CLARK CONTROLLER CO. TO: OUR CUSTOMERS

SUBJECT: MAGNETIC AMPLIFIERS m/a

HERE ARE THE SIMPLE FACTS ABOUT OUR MAGNETIC AMPLIFIERS:

USED PRIMARILY AS INDUSTRIAL DRIVE REGULATORS ON CONTROL SYSTEMS, THEY CONSIST BASICALLY OF THREE MAGNETICALLY-COUPLED ELEMENTS:

1. A CONTROL FIELD –
2. A FEEDBACK FIELD –
3. A CONVERSION UNIT –

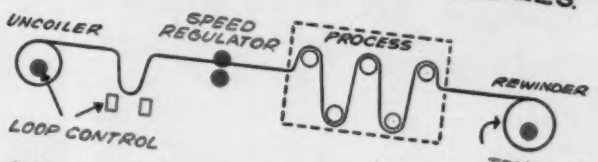


ELEMENTARY MAGNETIC AMPLIFIER

IF CONTROL FIELD AMPERE TURNS EXCEED FEEDBACK FIELD AMPERE TURNS IN A POSITIVE DIRECTION, OUTPUT IS TURNED ON. IF THE REVERSE OCCURS, OUTPUT IS TURNED OFF.

HERE'S HOW THIS IS APPLIED: IN A GENERATOR VOLTAGE REGULATOR, FOR EXAMPLE, THE CONTROL FIELD IS CONNECTED TO A REFERENCE SOURCE OF VOLTAGE, THE FEEDBACK FIELD TO THE ARMATURE TERMINALS, AND THE SHUNT FIELD TO THE LOAD TERMINALS. INCREASING AMPERE TURNS IN THE CONTROL FIELD TURNS ON THE REGULATOR, RAISING GENERATOR VOLTAGE UNTIL FEEDBACK BALANCES CONTROL FIELD, AT WHICH POINT THE SYSTEM STABILIZES.

AMONG THE MANY REGULATING SYSTEMS USING THIS PRINCIPLE ARE: CONSTANT TENSION COIL WINDING, SPEED REGULATION, POSITION REGULATION (LOOP CONTROL, EDGE CONTROL, SYNCHRONIZING CONVEYORS, ETC.).



MECHANICAL SCHEME FOR CONTINUOUS WEB OR STRIP PROCESSING CONTROL

THE MAGNETIC AMPLIFIER HAS ALMOST LIMITLESS APPLICATION AS A "SERVO" DEVICE TO MAINTAIN A PRE-DETERMINED RELATIONSHIP BETWEEN TWO FACTORS AS IN HEAT CONTROL, WEIGHT OR VOLUME CONTROL, PRESSURE CONTROL, TRANSDUCERS, METERING, CONTINUOUS PLATING CONTROL, ETC.

AS YOU CAN SEE FROM THE ABOVE, CLARK MAGNETIC AMPLIFIERS ARE IDEAL FOR USE IN AUTOMATION SYSTEMS. THEY ARE STATIC DEVICES WITHOUT TUBES, THUS REQUIRING NO WARM-UP TIME AND PRACTICALLY NO MAINTENANCE. THEY ARE FACTORY ADJUSTED, SIMPLIFYING INSTALLATION.

Clark's wide experience in applying magnetic amplifiers to industrial drives is at your service.

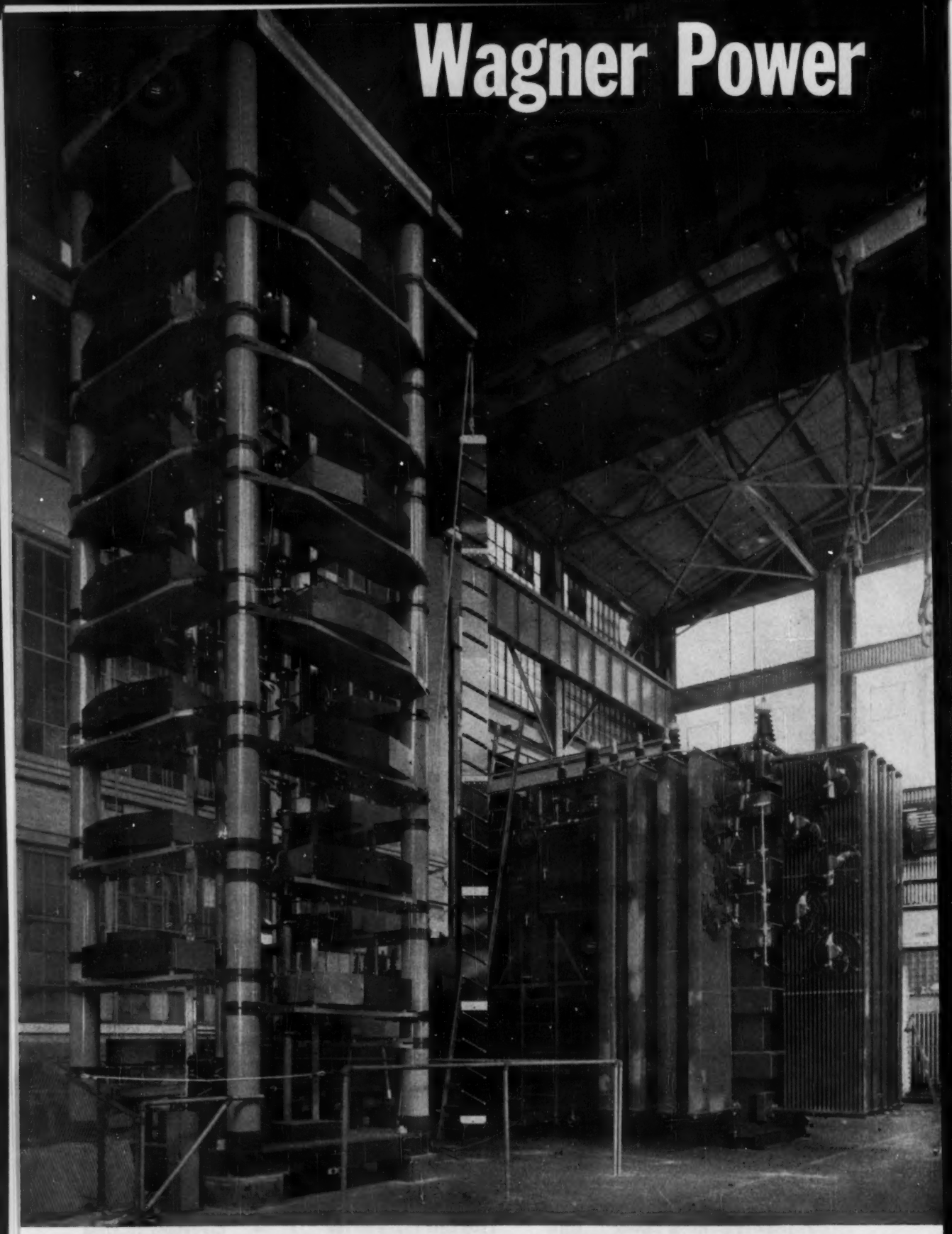
The CLARK CONTROLLER Company

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

Wagner Power



Impulse test being given to a new power transformer in the Wagner transformer plant. The 3 phase, 60 cycle transformer under test is rated 20,000/25,000/33,333 Kva forced air cooled.

Transformers

Designed—insulated—and tested to handle heavy voltage surges for assured power continuity

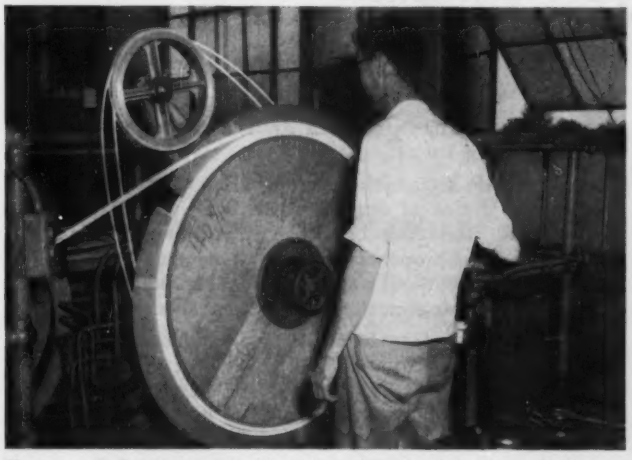
Wagner has been building power transformers for sixty-five years. The knowledge gained and the facilities acquired in all those years make the designing and building of fine power transformers part of the day's work at Wagner.

Wagner power transformers are designed and insulated to withstand practically any lightning or switching surge that might be encountered on a properly protected transmission line.

But, because heavy surges are the greatest enemy of transformer life, Wagner subjects every new design to rigid tests to make doubly sure that these transformers will provide the utmost reliability and service continuity.

Consult Wagner on your next power transformer installation. Thirty-two branches are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

Buffer coils are used at the ends of the high voltage windings for Wagner power transformers. They protect against surges by absorbing the first impact of any line disturbance.



The two coils forming one double disk section of a high voltage buffer coil are wound at one time on the same machine.

The buffer coils have extra cable paper insulation on the conductor. Each section is individually wrapped with insulating tape.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

BRANCHES IN 32 PRINCIPAL CITIES

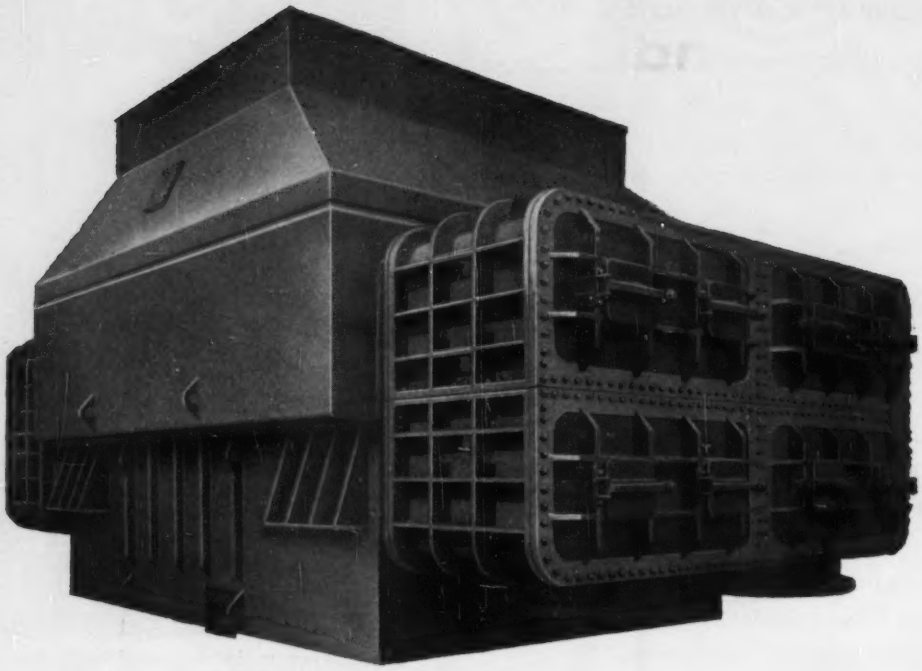
Wagner Electric Corporation
EST. 1891

T56-11

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

SUPERIOR

of I-R condenser design



I-R space-saving surface condenser sets the pace in steam plant practice

FOR YEARS Ingersoll-Rand condensers have made possible a new concept of condenser design and efficiency. Incorporating controlled longitudinal steam distribution and graduated tube spacing, all I-R condensers feature an ultra-compact arrangement of internal elements in a rectangular shell. This permits maximum utilization of the condenser space available.

Continual refinements in design are contributing to ever smaller space requirements for a given condensing capacity. These developments conform with the modern trend to higher turbine efficiencies and more compact turbine designs in reduced foundation areas for a given kw rating.

The I-R rectangular design permits varying the ratios of length, width and height without sacrificing condenser performance. Dimensional proportions can be changed over wide limits without departing from the basic standard arrangement of internal elements.

These advantages help make I-R condensers the most efficient available today — readily adaptable to all steam plant requirements. Your I-R engineer will be glad to give you further information.

4-445

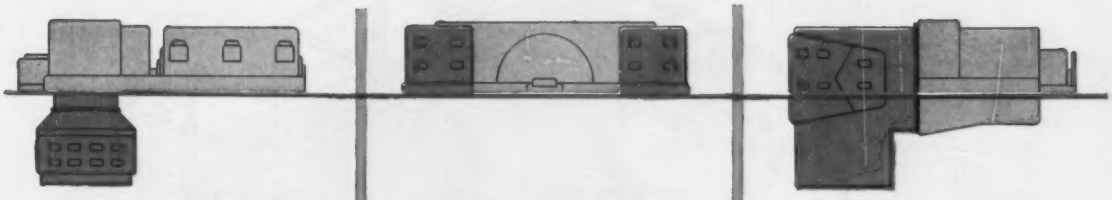
Ingersoll-Rand

11 Broadway, New York 4, N.Y.

COMPRESSORS • TURBO-BLOWERS • ROCK DRILLS • AIR TOOLS • CENTRIFUGAL PUMPS • CONDENSERS • GAS AND DIESEL ENGINES

ADAPTABILITY

meets today's needs for all turbine-condenser arrangements



BOTTOM EXHAUST TURBINE

Regardless of headroom limitations, I-R surface condensers permit effective utilization of the space available. The sketch above represents a condenser of 65,000 sq ft, serving a 135,000 kw turbine. It requires a headroom of only 14 feet 8 inches. Maximum economy of installation, operation and maintenance is assured. The extreme versatility of the I-R condenser helps meet the widest range of modern steam plant requirements.

SIDE EXHAUST TURBINE

Mounted on the turbine floor, this Ingersoll-Rand condenser is integrated into the advanced design of a huge generating unit serving a large mid-western utility. The twin condenser shells are directly connected to the dual side exhausts of the cross-compound steam-turbine. In this way, the condenser can be selected for the most economical design proportions without regard to the usual limitations of headrooms and other space consideration. The entire condensing surface is above the operating floor.

AXIAL EXHAUST TURBINE

Another outstanding example of I-R adaptability is afforded by this condenser that connects directly to the exhaust of an axial flow exhaust turbine. The condenser unit is of the single-pass rectangular type, with divided water boxes. The result of close cooperation between I-R engineers and the turbine designers, it marks an important step forward in modern steam plant practice.

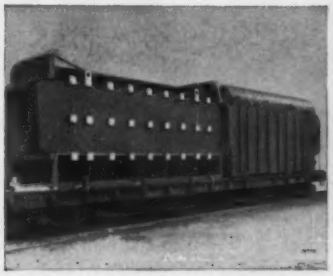
Another cost-saving feature of I-R condensers!

FACTORY ASSEMBLY AND FLANGED CONSTRUCTION

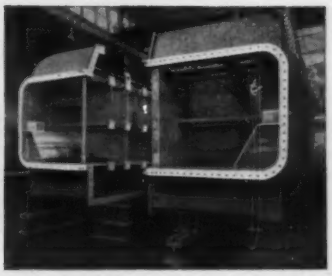
reduce field-fitting and erection welding

Every I-R condenser is assembled at the factory. Then it is disassembled and shipped in sections. Mating surfaces of the shell are machine-flanged, aligned and dowelled.

When the condenser arrives at the customer's plant, the shell sections are easily realigned and bolted together. This quality control feature is another reason why I-R condensers cost less to install.



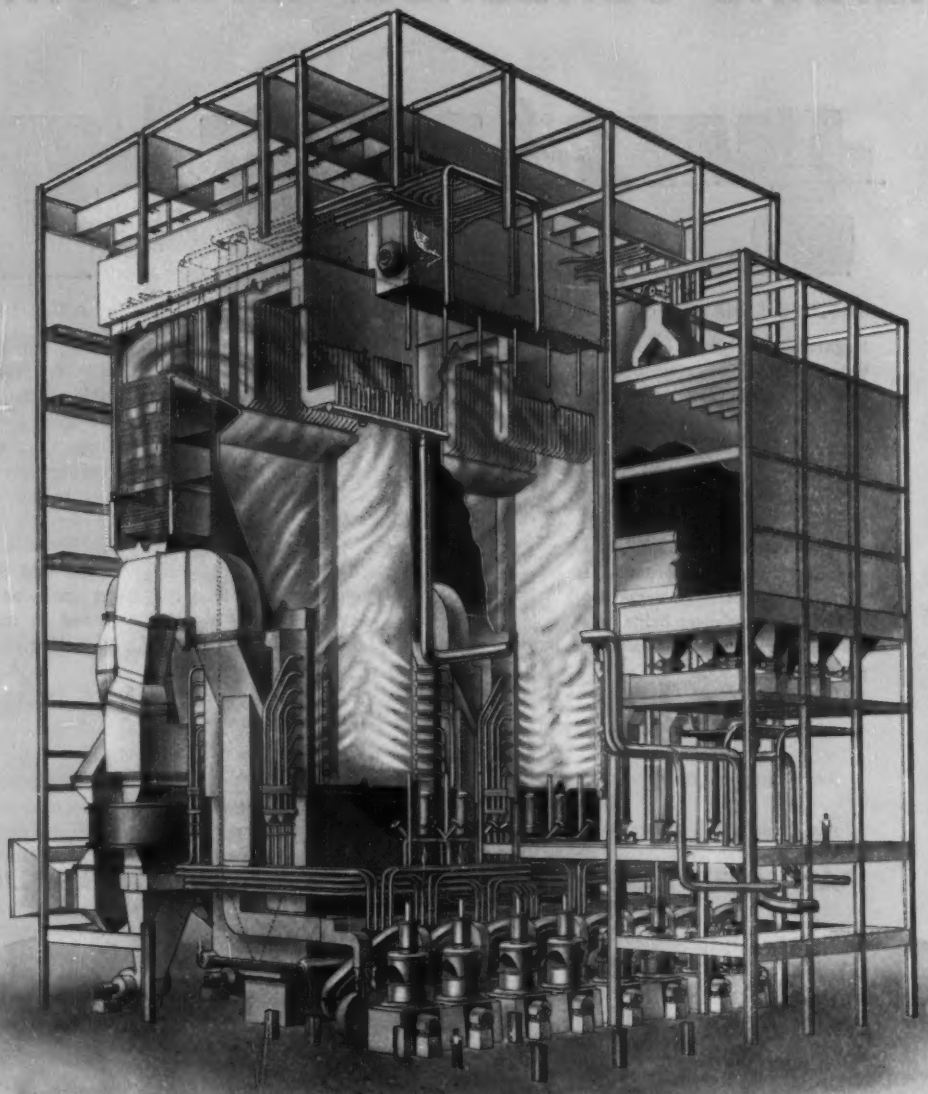
Mounted in sections on railway car, this condenser is going to customer's plant. When erected, all parts will line up perfectly



Full flanged joints and bolting pads of internal bracing on this condenser reduce field-fitting and welding

A PROVEN DESIGN FOR

It's C-E's Controlled Circulation Twin-Furnace



THE C-E CONTROLLED CIRCULATION TWIN-FURNACE BOILER

Presently there are 35 such units in service, under construction or on order. They range in size from 200 to 325 mw with design pressures from 2050 to 2750 psi. The first unit went into service in November, 1954. At present there are eleven units on the line.

BETTER BIG BOILERS

Boiler with Tilting Tangential Burners

EVER-BIGGER TURBINES ARE THE ORDER OF THE DAY...

What this means to boiler design is obvious. Boiler circulation . . . superheat control . . . reheat control . . . expansion . . . structural size and design . . . the relationship of furnace volume and geometry to heat absorption surface. . . . accessibility . . . all are factors that caused C-E engineers to take a new, long, hard look at big boiler design. The result is the C-E Controlled Circulation Twin-Furnace Boiler with Tilting Tangential Burners. Here are some of its advantages.

1. The principle of controlled circulation guarantees positive water supply to all boiler parts in both furnaces in exact accordance with their needs.

2. Superheater and reheater surfaces are in separate furnaces — each fired by tilting tangential burners. Regardless of load, superheat and reheat temperatures can be controlled independently and accurately.

3. The superheater furnace can be lit off independent of the reheat furnace and heated water can be circulated through both to establish equal expansion throughout.

4. The reheat furnace can be lit off after the turbine is rolling and after steam is flowing through it. Thus protection of reheater surface during start-ups is assured.

5. The volume of each furnace can be properly proportioned to the heating surface it contains without the use of internal dividing walls. All walls are accessible for cleaning.

6. Lighter structural members can be used since load concentrations and spans are considerably reduced using two smaller furnaces in place of one extremely large one.

The facts itemized above tell only part of the story. For instance, C-E Controlled Circulation Boilers offer greater design flexibility, faster load response, steadier water level, shorter outages for maintenance, quicker start-ups and numerous other advantages. The C-E Tilting Tangential Burner exerts tight control over superheat and reheat temperatures and minimizes the use of spray water for desuperheating.

In all, Controlled Circulation *plus* Twin Furnace Design *plus* Tilting Tangential Burners add up to the right answer for big boiler design.

COMBUSTION ENGINEERING

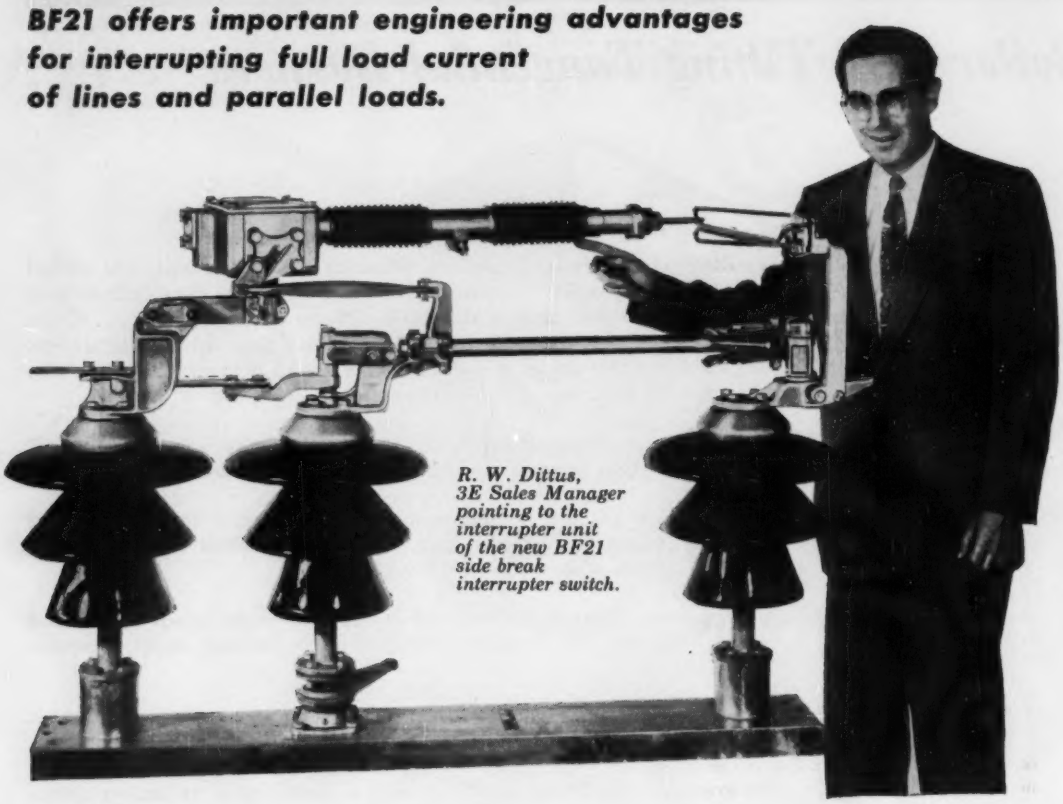
B-954

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

STEAM GENERATING UNITS • NUCLEAR REACTORS • PAPER MILL EQUIPMENT • PULVERIZERS • FLASH DRYING SYSTEMS • PRESSURE VESSELS • HOME HEATING AND COOLING UNITS • DOMESTIC WATER HEATERS • SOIL PIPE

New! 3E Outdoor Interrupter Switch

BF21 offers important engineering advantages for interrupting full load current of lines and parallel loads.



R. W. Dittus, 3E Sales Manager pointing to the interrupter unit of the new BF21 side break interrupter switch.

CONSTANT HIGH SPEED INTERRUPTION

Contact speed is independent of the time taken to operate the switch for both opening and closing. The interrupter unit for each pole of the switch has its own self-contained high speed mechanism.

COMPLETELY CONFINED ARC. Interruption takes place inside the arcing chamber . . . here the arc created by the interruption is confined and extinguished.

FAST CLEAN INTERRUPTION . . . one cycle or less.

DRY TYPE INTERRUPTER UNIT. The arc is interrupted in the arcing chamber by the pressure and effective blast of gases produced by the action of the arc upon solid material enclosed in the arcing chamber, and no oil or air blast is required.

OVERLOAD CAN'T DAMAGE INTERRUPTER UNIT. The interrupter is out of the circuit when the switch is in the closed position.

THE BF 21 outdoor interrupter switch is basically the efficient, simple BF20 side break switch plus the new interrupter unit. The new BF21 is now catalogued in units through 46 K.V.

3E interrupter switches in voltages up to 115 KV have already been installed. As with the rest of 3E's line, we invite your inquiry for special applications.

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS, U.S.A.

VALUES TO LOOK FOR IN TWO-WAY RADIO

Type CMF
100A Series
25-54 mc

HIGH POWER

for greater
2-way radio
coverage

...in the new RCA Carfone FIFTY for low band!

100 WATTS OF POWER

in the new CMF 100A Series for 25-54 mc plus other quality features make it the finest equipment RCA has ever offered for low band coverage! Designed to provide greater range and a better signal at any distance, this sharp increase in power means improved performance, mobile to mobile, and throughout the system.

HERE'S YOUR ANSWER

to increased reliability, lower maintenance, built-in reserve power, much greater adaptability—the new RCA Carfone Fifty!

"Mark of Quality"

PLUS THESE QUALITY FEATURES

- Built-in 6/12 volt convertibility.
- Best frequency stability.
- Elliptical loud speaker providing 3 times more acoustical power than the ordinary type.
- Color directed "rainbow" tuning.
- Sturdy drawer-type modern design case.
- Functionally perfected, hand fitting "Red Head" Microphone. (Transistorized or carbon type.)

RCA 2-WAY RADIO

RADIO CORPORATION of AMERICA

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Radio Corporation of America
Communications Products
Dept. JC-45, Building 15-1, Camden, N.J.

☐ Please send me complete information on new RCA 25-54 mc Carfone equipment.

☐ Have RCA Communications Specialist make a FREE radio survey of my business.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

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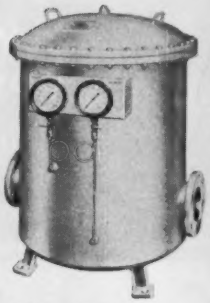
CFC COMPLETE FILTRATION COVERAGE

there's a Commercial Filters unit engineered for your filtering job...

Fulflo FILTERS

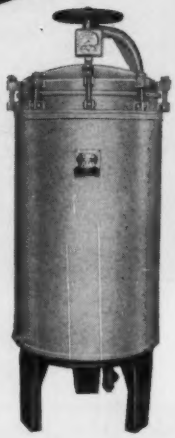


Fulflo Filters provide optimum clarity at ultra-high flow rates. For all industrial fluids—including oils, liquid fuels, chemicals, water, compressed air and various gases. Sizes to handle flow rates up to 1,600 gpm. Pressures to 4,000 psi.

Fulflo Filters feature Honeycomb Filter Tubes, the "precision controlled density" element that filters every drop again and again to give you microscopic clarity. Choice of cotton, acetate, nylon, orlon, dacron, dynel or glass fibres.

Standard models available in steel, stainless steel, rubber lined steel or nickel-plated brass. Custom models engineered to special requirements.

Honan-Crane FILTERS



Honan-Crane Filters offer "clean oil" filtration in diesel, turbine, hydraulic, metal-working and quenching operations. Bulk refill models provide depth filtration with cellulose medium for additive oils and Cranite (fullers earth) medium for straigth mineral oils. Multi-cartridge models feature six different types of cartridges that may be used interchangeably depending on type and degree of filtration desired. Flo-Pac models, installed in line, handle flow rates up to 900 gpm. All have quick-opening covers for ease in changing refills.

other CFC products

Purivac Insulating Oil Conditioners
High Pressure Hydraulic Filters
Magnetic Separators
Plating Filters
Coolant Clarifiers
Oil Burner Filters
Compressed Air Filters
Dri-Pure Water-Oil Separators
Pre-Coat Filters
Water Filters
Beverage Filters
Pharmaceutical Filters
Automatic Tubular Conveyors

FILTERS Michiana

Diesel and gasoline engines get complete protection against the damaging effects of dirty oil with Michiana Lube and Fuel Oil Filters. Designed for low cost filtration and proven in thousands of installations. "Throw-away" or repackable filter elements. Available in a wide range of sizes and models.

Write for literature or engineering help covering your filtration problem.

CFC

COMMERCIAL FILTERS CORPORATION

MELROSE, MASSACHUSETTS • LEBANON, INDIANA

CONSULTING ENGINEERS: SARGENT AND LUNDY

G-E progress in cross-compound design offers

MORE ECONOMY FOR TODAY'S HIGHER RATINGS

Keeping pace with today's demands for higher ratings and greater efficiencies are General Electric developments in cross-compound turbine-generator design. This design separates high- and low-pressure sections, permitting greater efficiency in each. Latest G-E cross-compound designs offer better economies than ever before obtainable.

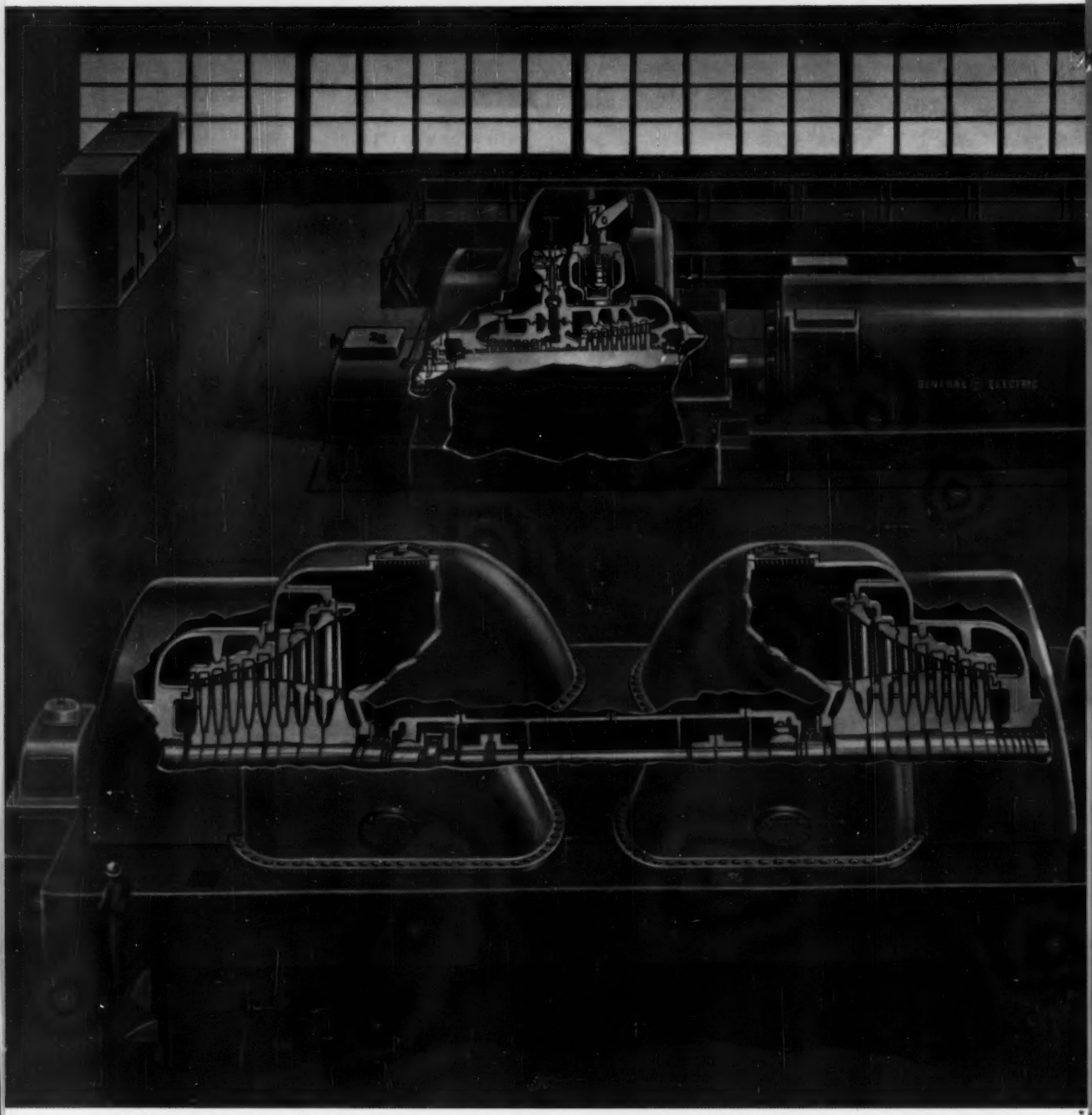
An application of this design is Unit No. 2 (above), now in operation in the Will County Station of the Public Service Company Division, Commonwealth Edison Company. Located near Chicago, the Will County Station is an important power producer for Northern Illinois.

This installation typifies the vigorous efforts being made by progressive electric utility companies to expand and improve the efficiency of their power generation systems to provide adequate low-cost electricity for increasing loads.

Progress Is Our Most Important Product

GENERAL ELECTRIC

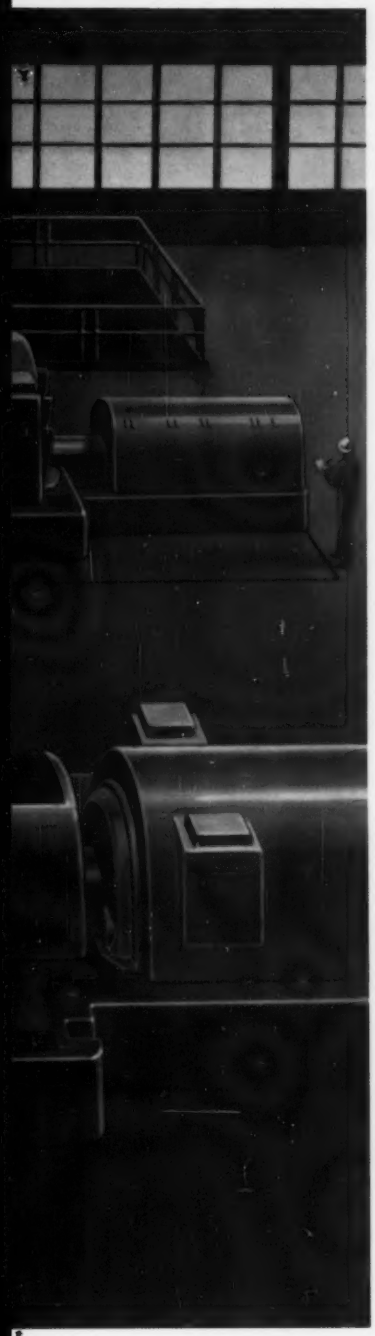
Now G-E design of cross-compound



LOW-PRESSURE SECTION (front) with 38-inch last-stage buckets carries 40% of unit's total load and operates at 1800 rpm. Low-pressure (about 80 psig) and low-temperature (560 F) steam enters opposite ends of section, flows towards center. Steam exhausts downward to condenser through a single condenser opening. Low speed allows use of large, efficient last-stage buckets and liberal exhaust hoods—two features vital to the efficient performance of higher-rated turbines operating at low-exhaust pressures.

HIGH-PRESSURE SECTION (rear) of opposed-flow design carries 60% of unit's total load and operates at 3600 rpm. Steam enters in the center, flows to the left (or front), exhausts downward. Reheated in the boiler, it re-enters turbine adjacent to initial steam entry, flows to the right, exhausts to crossover pipes leading to low-pressure turbine. This design permits admission of both initial and reheat steam near the center of the high-pressure casing, thus concentrating high temperatures in a small area.

units brings new high in efficiency



Longer last-stage buckets in low-pressure section give maximum efficiency

The 1800 rpm speed of the low-pressure section permits the use of longer last-stage buckets which provide greater efficiency at low exhaust pressures. On a 250,000 kilowatt cross compound unit, for example, this can mean a saving of as much as 50 million pounds of coal per year.

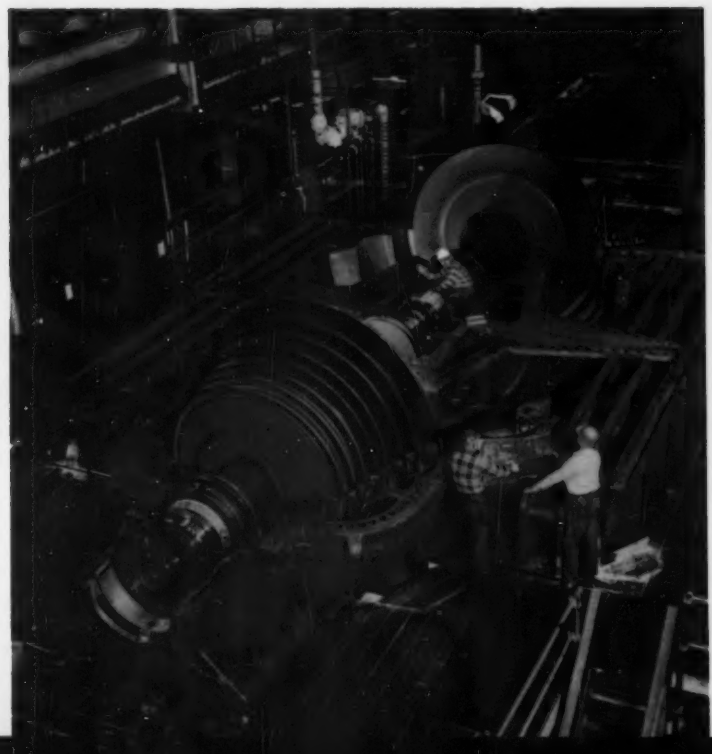
In the 3600 rpm high-pressure section, General Electric's opposed-flow design avoids severe temperature gradients with resulting thermal distortion by concentrating all high-steam temperatures in one small area of the casing. This design and the use of special high-pressure, high-temperature parts has resulted in outstanding efficiency.

Because there are two sections, each is comparatively short—a feature helpful in making more compact station arrangements. In fact, some designs of cross-compound units can easily be fitted into extensions of existing stations which cannot accommodate other designs of equal rating.

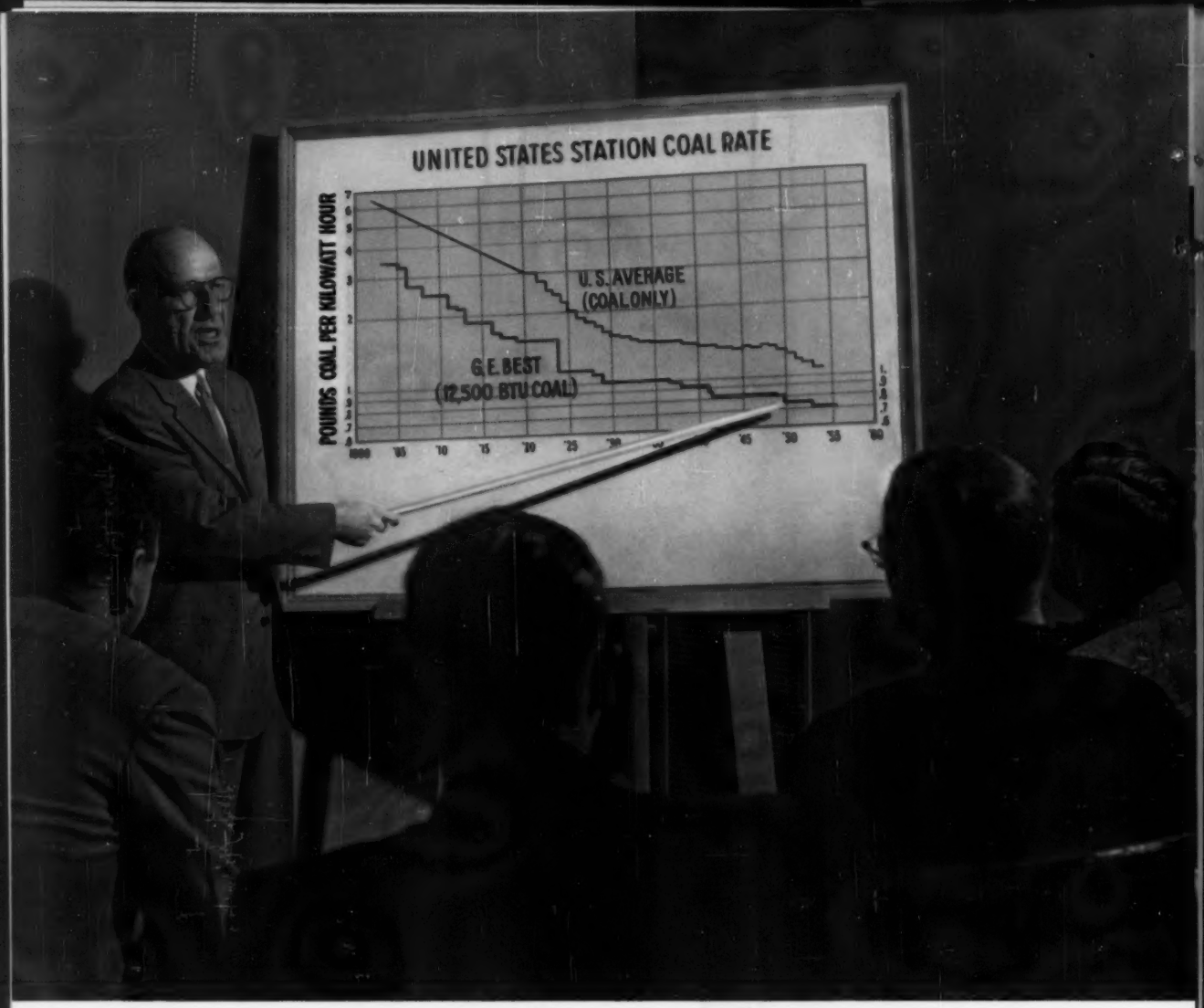
These are but a few of the ways in which General Electric's cross-compound design and arrangement have already achieved new highs in operating economy for turbine-generators. Read what C. W. Elston has to say about future turbine fuel economy on the next page.

Leader in Turbine-Generator Progress

GENERAL ELECTRIC



LOW-PRESSURE SECTION being assembled for careful factory inspection. This unit is one of the many large cross-compound turbines now being shipped to progressive electric utilities.



Can Turbine Fuel Economy Be Improved?

A statement by C. W. Elston, Manager—Turbine Engineering

The past twenty years have seen a phenomenal rise in the efficiency of steam turbine-generators. The best General Electric unit today requires 29 percent less fuel per kilowatt hour generated than the most efficient unit of twenty years ago. Can this improvement record be continued over the years to come?

It seems safe to answer that question in the affirmative. While future gains may not be quite so spectacular, there is considerable room for further improvement. The future increase in steam turbine-generator efficiency will come in part from the use of higher steam pressures and temperatures, and in part as a result of further development in the art of designing turbines.

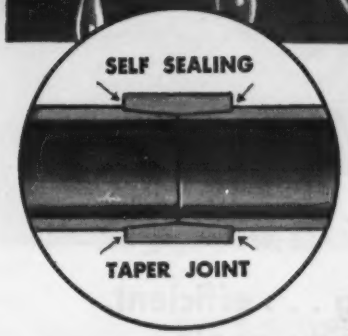
The opportunity for continuing improvement in turbine efficiency presents a challenge that is being met by the ingenuity and creativity of many G-E people in research, engineering, and manufacturing. Large Steam Turbine-Generator Department, General Electric Company, Schenectady 5, New York.

254-21

Progress Is Our Most Important Product

GENERAL ELECTRIC

WATERTIGHT!



Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.

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ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

The new and improved
HIGHWAY heavy-duty
"swing-base"

EARTH-BORING MACHINE

DIGS THE HOLE
AND
SETS THE POLE
in any Soil!

HIGHWAY

Faster, easier positioning . . . efficient, trouble-free digging at any angle

The newly developed Highway "Swing-Base" Earth-Boring Machine allows the operator to rotate the base 180° — and then extend it up to 22". The boring machine will dig at any point within this arc and within the forward and aft traverse. Both movements are hydraulic, allowing finger-tip control.

The unit can be mounted on either a single rear axle truck or a tandem with optional hydraulic stabilizing supports. The "Swing-Base" Earth Borer will dig 9" to 36" holes in any soil, faster and easier than ever before.

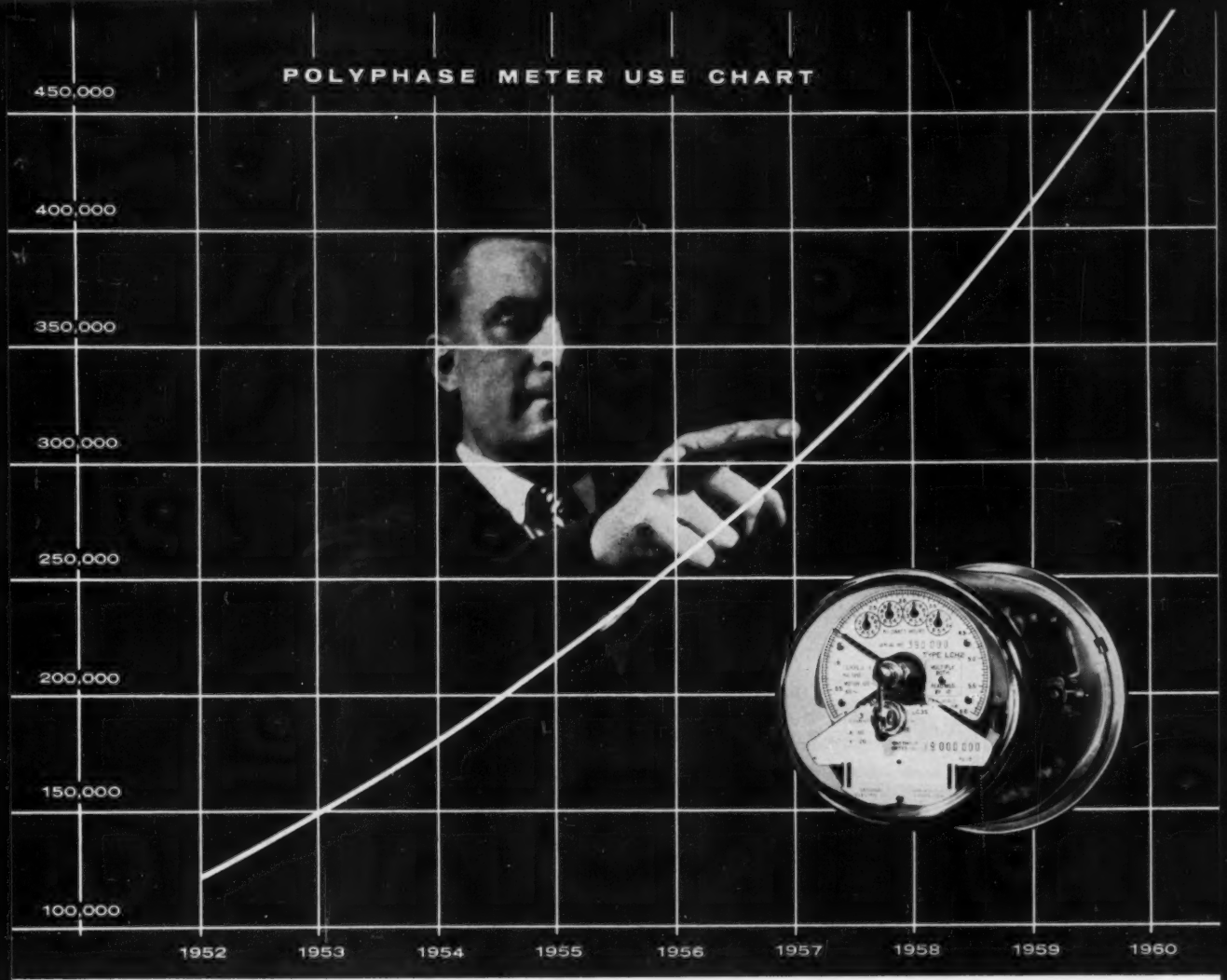
New swing base and extension give remarkable versatility and extreme flexibility, allowing exact positioning regardless of location or angle of the truck.

HIGHWAY UTILITY DIVISION
HIGHWAY TRAILER COMPANY

HEADQUARTERS: EDGERTON, WISCONSIN

Manufacturers of: Public Utility Bodies • Earth-Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories • Commercial Trailers • Trailerized Tanks and Dry Bulk Haulers.

SALES AND SERVICE IN PRINCIPAL CITIES



Polyphase meter usage going up!

For a polyphase future use Sangamo single disk meters

Polyphase metering is on the march. From past records it appears that the use curve of polyphase meters will reach 500,000 annually by 1960! Better look to your polyphase meters . . . now.

All Sangamo Polyphase Meters—2, 2½ *and 3 element*—are single disk meters. The 3 element meter takes no more wall space than the 2 element meter. When you change to 4 wire Y, you will find the 3 element meter fitting in where the 2 element meter was before.

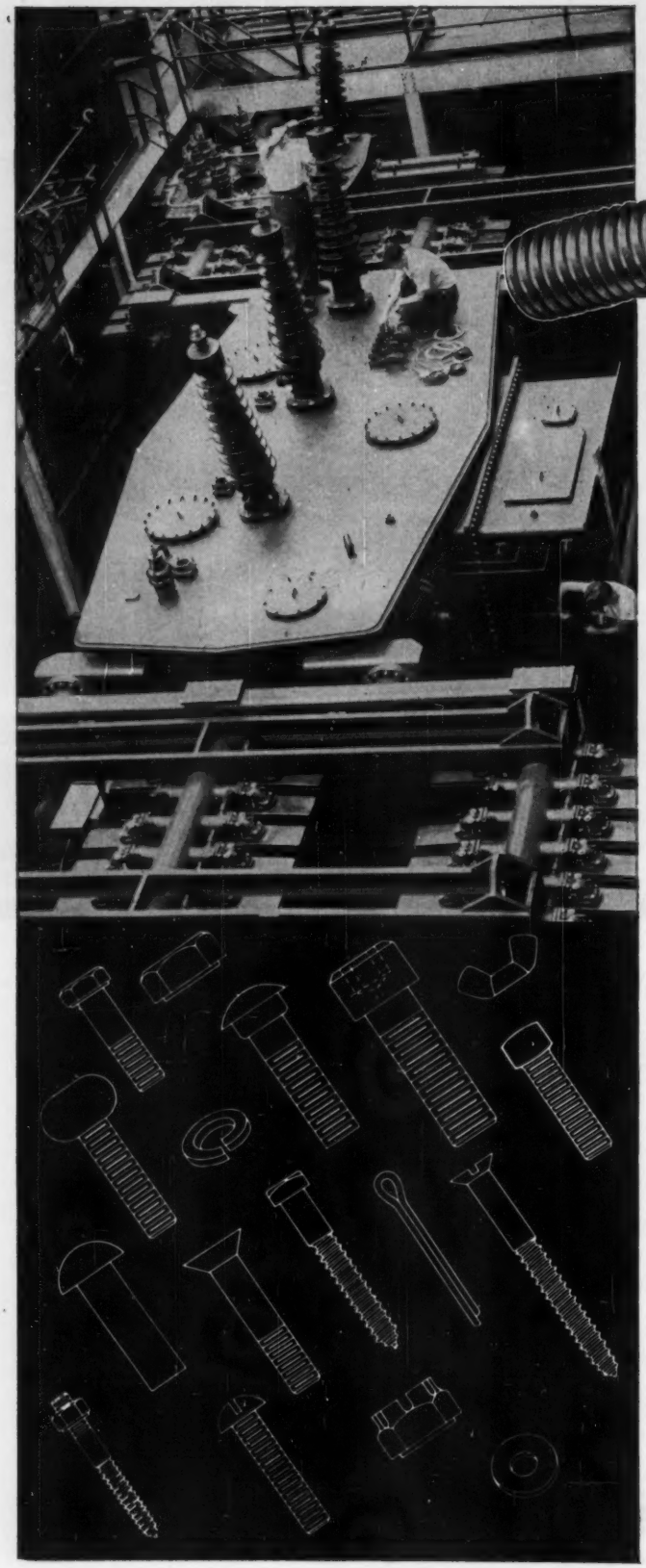
The LC meters are high torque meters, ruggedly made for the polyphase loads of today and tomorrow.

Plan for a polyphase future—with Sangamo.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM56-7



½—13 x 3
Oval Neck
Silicon Bronze
Connector Bolt

STOP CORROSION

Enemy of Utilities!

Ugly, wasteful corrosion . . . shortening the life of utility equipment . . . adding to maintenance costs.

Prevent this Public Utility Enemy from gaining a foothold. Everlasting Fastenings by Harper solve corrosion problems—protect costly electrical equipment—give years of on-the-job service.

Harper corrosion-resistant fastenings are produced by the largest specialist in fastenings of non-ferrous metals and all stainless steels. Over 7,000 different stock items quickly available.

For specialized fastenings, Harper engineers and metallurgists are ready to serve you—backed by knowledge gained through 30 years' experience. Call on Harper—Branches and Distributors in all major market areas, or write for the new Harper catalog.

THE H. M. HARPER COMPANY
8205 Lehigh Avenue
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BOLTS • NUTS • SCREWS • WASHERS
RIVETS • COTTER PINS • SPECIALS

SILICON BRONZE • COPPER • ALUMINUM
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ALL STAINLESS STEELS

HARPER
EVERLASTING FASTENINGS

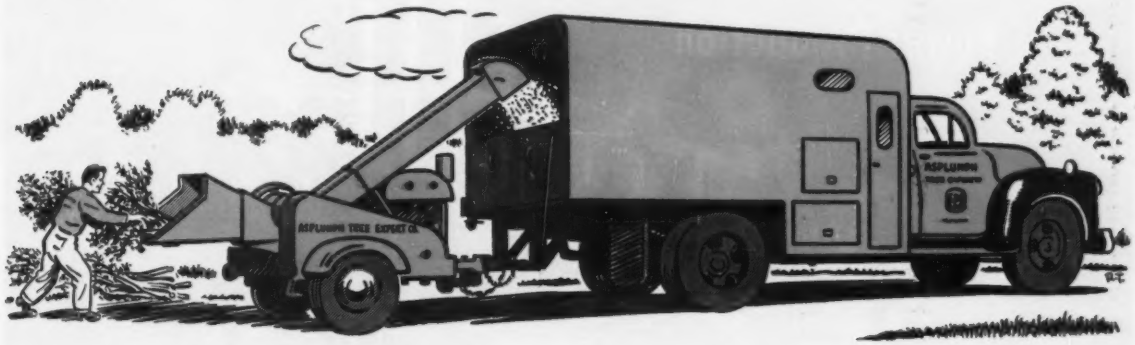
SPECIALISTS IN ALL
CORROSION-RESISTANT FASTENINGS

NATION-WIDE SERVICE

Asplundhs work *exclusively* for the Public Utilities of America.

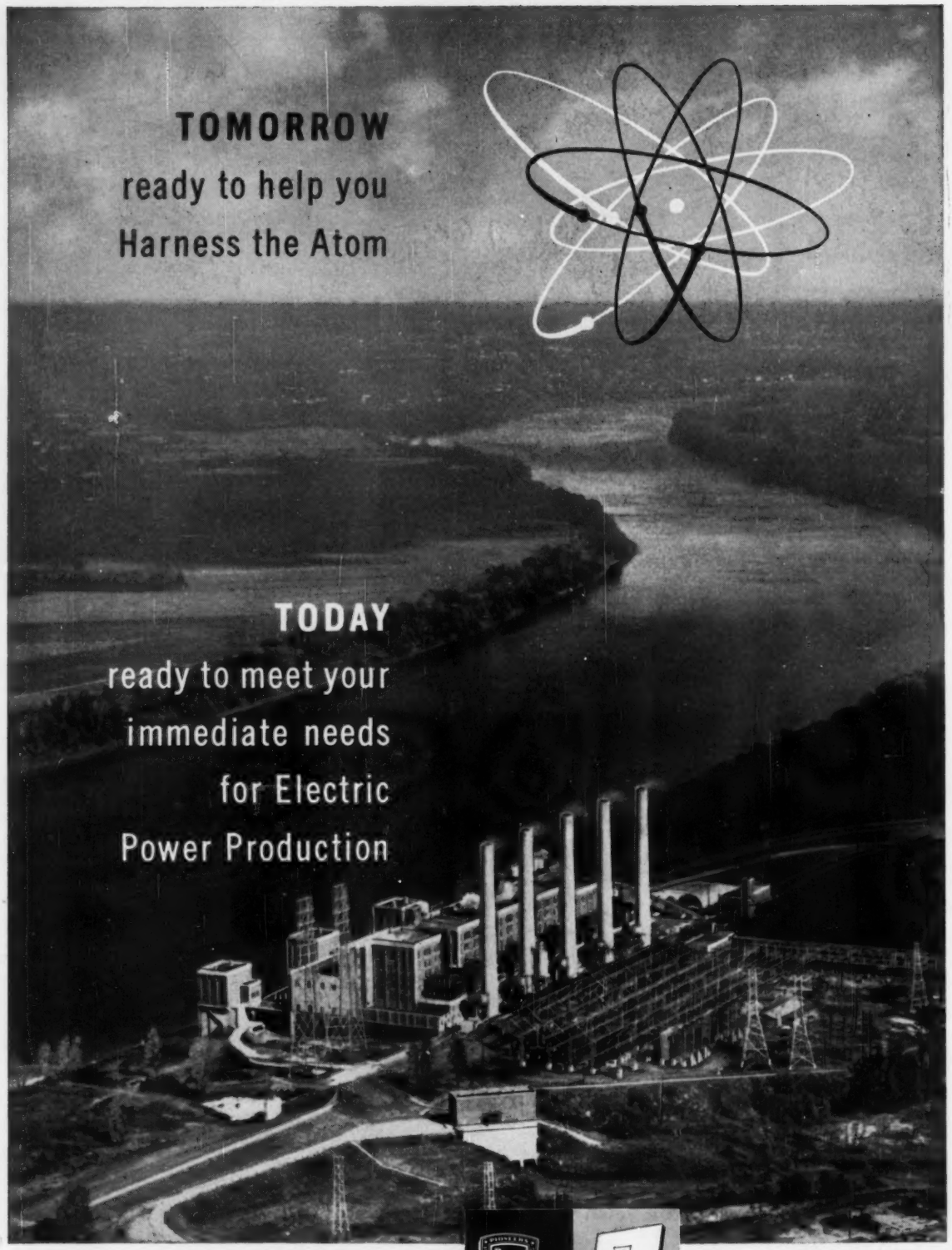
Our line clearance and right-of-way operations are not a side line but a highly specialized business which enables our clients to provide better service, enjoy finer public relations, and save substantially on all their tree work.

This specialization applies to our trained personnel, superior supervision, modern equipment, complete insurance coverage, safe operation, strategically located service centers, and sound administration policies. We'd like to talk it over with you!



Write for your copy of our new EMERGENCY FOLDER, with day and night listings of Asplundh men to call when a storm makes special, fast tree work imperative.

ASPLUNDH TREE EXPERT CO.
Jenkintown, Pa. and principal cities



Pioneer Service & Engineering Co.

231 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

54 YEARS

Serving power plant needs of Industries and Utilities for 54 years.

Send for our descriptive booklet, "Pioneering New Horizons"

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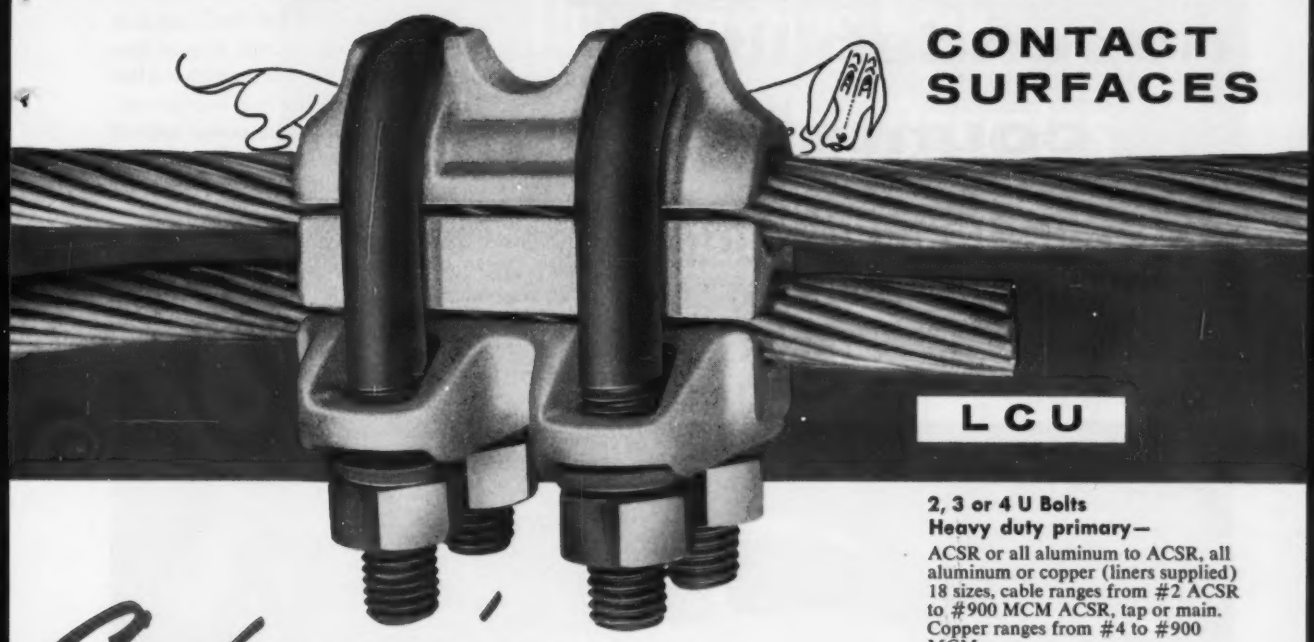
CONTACT SURFACES

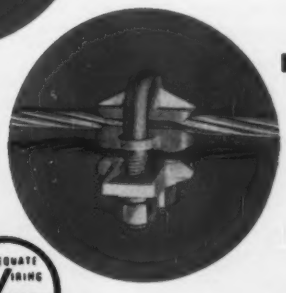


2, 3 or 4 U Bolts
Heavy duty primary—
ACSR or all aluminum to ACSR, all aluminum or copper (liners supplied) 18 sizes, cable ranges from #2 ACSR to #900 MCM ACSR, tap or main. Copper ranges from #4 to #900 MCM.

Andersons U-BOLT CONNECTORS

LCA

General primary—
ACSR or all aluminum to ACSR or aluminum. 14 sizes, cable ranges from #4 to #397.5 MCM ACSR, tap or main.



LCC

General primary—
ACSR or all aluminum to copper (liners supplied). 21 sizes, cable ranges from #4 ACSR to #636 MCM ACSR. Copper ranges from #8 to #500 MCM.

- ★ Flared cable openings assure non-cutting or nicking of conductors!
- ★ All aluminum construction for equal thermal coefficients of expansion for aluminum to aluminum cable!
- ★ High conductivity center spacer for low contact resistance and cable protection.
- ★ Greater individual connector cable ranges simplifies stocking

ADEQUATE WIRING SERVES AND SAVES

For more complete information consult your nearest ANDERSON representative

Aluminum & Bronze **POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES**
for SUBSTATION • TRANSMISSION • DISTRIBUTION

ANDERSON ELECTRIC
CORPORATION

P. O. DRAWER 6107 • BIRMINGHAM 6, ALABAMA

*Formerly Anderson Brass Works, Inc.

Out where dependability counts

YOU NEED THE NEW
INTERNATIONAL LIGHT-DUTY
4-WHEEL-DRIVE TRUCK

Whether the way leads by road or across country . . . *you can depend on* an INTERNATIONAL light-duty four-wheel-drive truck to deliver crew and equipment to the job site.

This new INTERNATIONAL model S-120 (4x4) can help the job schedule move faster, more surely. It goes anywhere, through sand, snow, mud . . . pulls through the bad spots . . . doesn't have to be driven the long way around.

Exclusive INTERNATIONAL full-torque power take-off transfer case available, plus power take-off transmission for auxiliary equipment. It's available in 6 tire sizes for ample clearance, extra flotation and traction.

And like every INTERNATIONAL, it is all-truck built to save you the BIG money over the years . . . the operation and maintenance money. See your INTERNATIONAL Truck Dealer or Branch today, learn more about truck dependability!

INTERNATIONAL HARVESTER COMPANY • CHICAGO

NEW Full-Size, light-duty model S-120 (4x4) gives you a gross vehicle weight of 7,000 lbs. Mounts pickup, Travelall,® service utility, stake or flat-bed bodies. Enjoy more convenience and comfort in exclusive Comfo-Vision cab. Short stroke, 131 horsepower engine standard equipment.

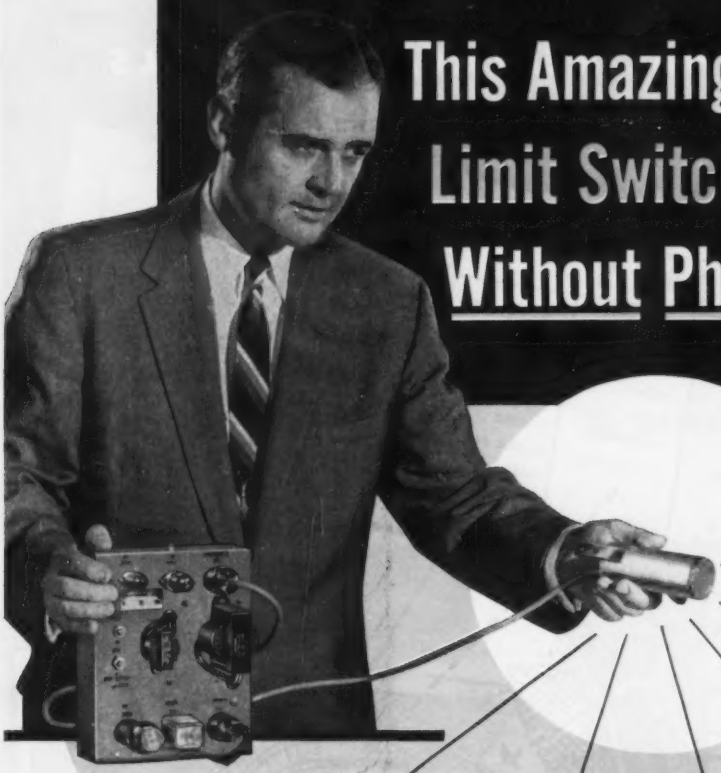
Complete line of INTERNATIONAL All-Wheel-Drive trucks available:
S-140 (4x4), 11,000 lbs. GVW.
S-160 (4x4) Series, 15,000-18,000 lbs. GVW.
SF-170 (6x6) Series, up to 26,000 lbs. GVW.

INTERNATIONAL® TRUCKS

All-Truck Built to save you the BIG money!

Motor Trucks • Crawler Tractors • Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

This Amazing New Limit Switch Operates Without Physical Contact!



Transducer (sensing head) is actuated by presence of magnetic materials over a wide range of sizes, shapes, weights, roughness, speeds

No moving parts. No metal-to-metal contact required for operation

Sensitivity up to 1 inch

Can be mounted in any position. Not affected by vibration

Small size (1⅞" x 6") Fits into tight spots

Non-magnetic material between the part and transducer does not affect operation

• Here's an entirely new concept in industrial limit switches! We've named it the **PROXIMITY LIMIT SWITCH** because it is actuated by the nearness of ferrous parts or materials. Since its operation requires no physical contact, it has unlimited applications in places where the use of conventional limit switches is either impractical or impossible! Its range of application is broadened, too, because the transducer (sensing head) is not affected by vibration or by the presence of non-magnetic material.

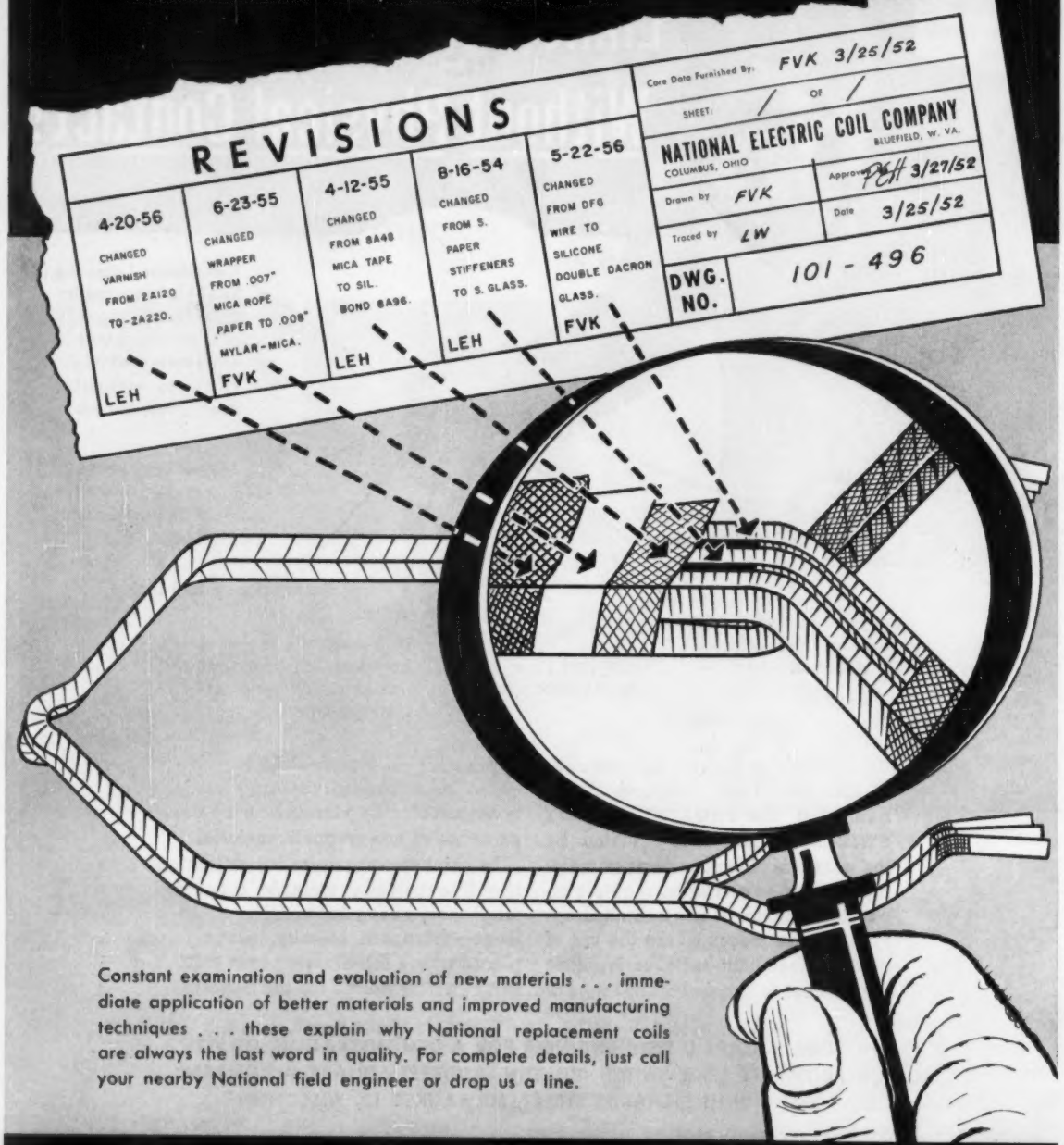
In paint spray systems, on production line presses, multiple process machines, heavy automation equipment—there are literally scores of places where this amazing new PROXIMITY SWITCH will do the job better!

ASK YOUR SQUARE D FIELD ENGINEER FOR A DEMONSTRATION. OR WRITE FOR PROXIMITY LIMIT SWITCH BULLETIN. ADDRESS SQUARE D COMPANY, 4041 NORTH RICHARDS STREET, MILWAUKEE 12, WISCONSIN

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

CONTINUAL IMPROVEMENT MAKES *NATIONAL REPLACEMENT COILS* THE LAST WORD IN QUALITY



Constant examination and evaluation of new materials . . . immediate application of better materials and improved manufacturing techniques . . . these explain why National replacement coils are always the last word in quality. For complete details, just call your nearby National field engineer or drop us a line.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

TRADE MARK

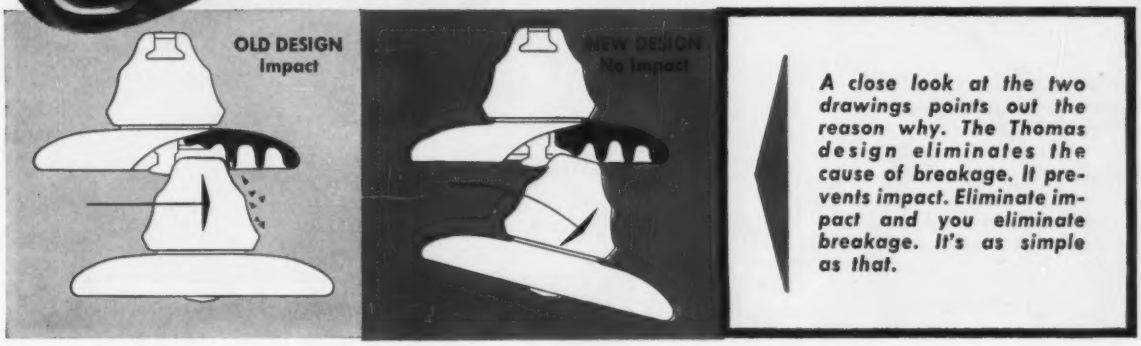
ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

TIME-TESTED AND FIELD-PROVED

Thomas

"CHIP-PROOF" INSULATORS*

- *eliminate impact*
- *eliminate breakage*



A close look at the two drawings points out the reason why. The Thomas design eliminates the cause of breakage. It prevents impact. Eliminate impact and you eliminate breakage. It's as simple as that.

In 1953, Thomas introduced the "Chip-Proof" insulator, designed to eliminate breakage caused by rough handling and assembling in the field. Today, utility service records have proved its worth in stopping breakage during assembly or disassembly of insulator strings. Here's why:

Thomas "Chip-Proof" design uses a "diverter skirt" — a heavy corrugation that can't break, designed with a contour that actually diverts the lower insulator or fitting away from the petticoats. No matter how roughly the insulators are handled, when the cap is pulled off the ball pin, it will first strike the diverter. This glancing blow deflects impact away from the lighter petticoats. Result: no chipping, no breaking . . . and a more rugged insulator.

Thomas "Chip-Proof" suspension insulators conform to the latest EEI-NEMA Standards (Classes 52-3 and 52-4) and are interchangeable with other units.

Throughout the country, wherever "Chip-Proof" insulators are now in use, their performance record speaks for itself. See your nearest representative today and ask for a demonstration.

Specify Thomas Insulators — The Best by Line Test.

**Patent applied for*

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS *our 83rd year* RELIABILITY 1956

Savannah Electric and Power Reports:

TROUBLE-FREE COMMUNICATIONS FOR FOUR YEARS WITH GENERAL ELECTRIC TWO-WAY RADIO

For the past four years, the Savannah Electric and Power Company has depended upon trouble-free G-E two-way radio to coordinate maintenance, transmission, and construction crews throughout a five-county, fifty-mile city radius.

General P. E. Seawright, Superintendent of Transmission and Distribution for Savannah Electric and Power, reports his organization has never experienced a serious break in two-way radio communications, during four years of operation. He credits General Electric's dependable equipment, teamed with a maintenance program provided by the local General Electric Authorized Service Station, for assuring his firm of full 24-hour radio services.

Radio Cuts Service Loss Time

Seventeen mobile units in the fleet of service and supervisory vehicles are coordinated by radio from the office of General Seawright, in the Savannah office.

General Seawright credits the G-E two-way radio system for speedy assists in the restoration of service in emergencies. This is a vital factor to the thousands of homes and commercial installations over 1000 miles of line.

New Progress Line Radio

General Electric's new Progress Line radio provides full chassis, interchangeability, plug-in chassis, and new 6600 series tubes, specially designed and tested for radio communication circuits.

Your Communications Counselor can give you full details. Call him in, or, write: *General Electric Co., Communication Equipment, Section X1996-17, Electronics Park, Syracuse, N. Y.* In Canada, write: *C.G.E. Electronics, 830 Lansdowne Avenue, Toronto.*

Progress Is Our Most Important Product

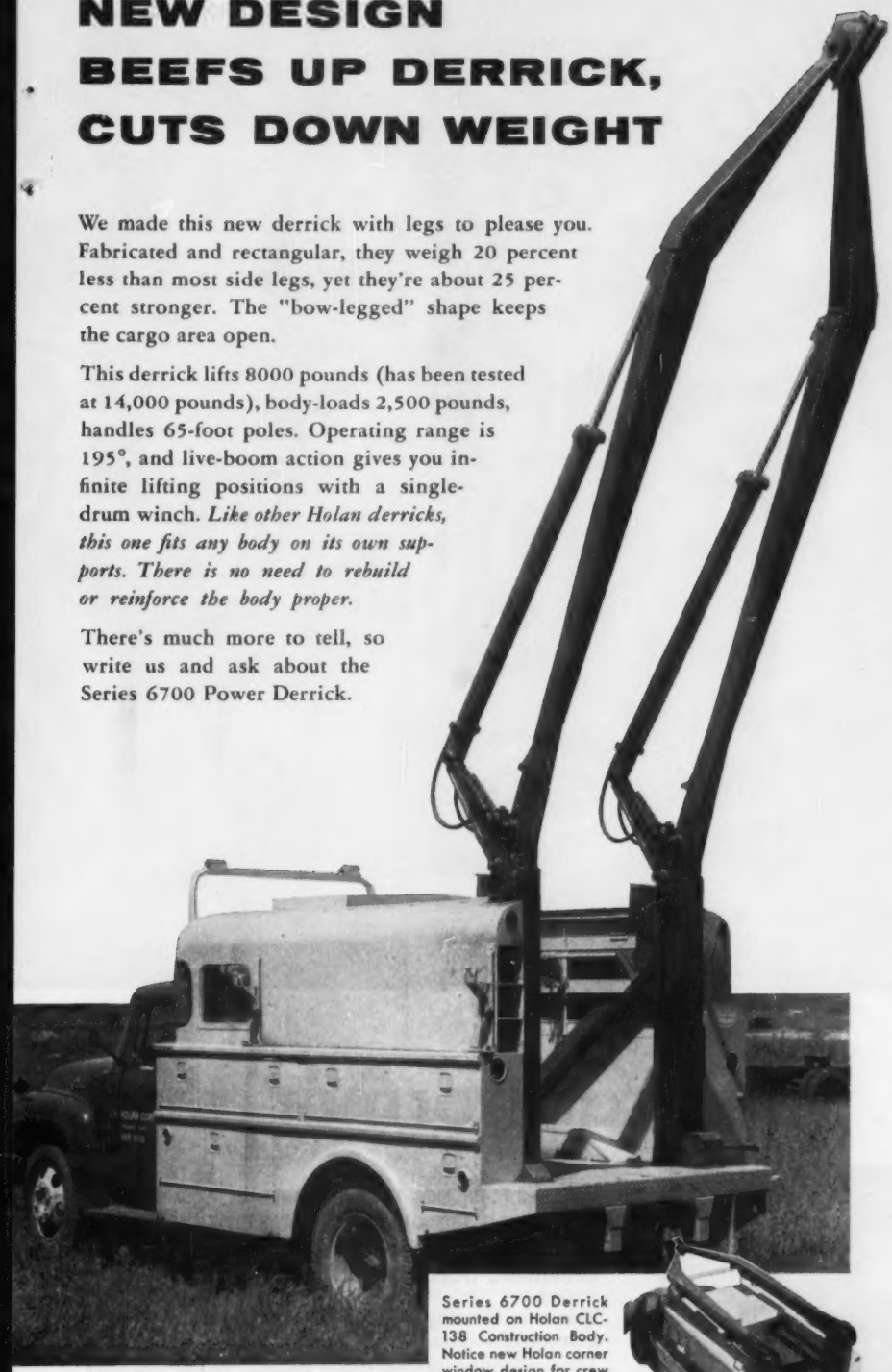
GENERAL ELECTRIC

NEW DESIGN BEEFS UP DERRICK, CUTS DOWN WEIGHT

We made this new derrick with legs to please you. Fabricated and rectangular, they weigh 20 percent less than most side legs, yet they're about 25 percent stronger. The "bow-legged" shape keeps the cargo area open.

This derrick lifts 8000 pounds (has been tested at 14,000 pounds), body-loads 2,500 pounds, handles 65-foot poles. Operating range is 195°, and live-boom action gives you infinite lifting positions with a single-drum winch. *Like other Holan derricks, this one fits any body on its own supports. There is no need to rebuild or reinforce the body proper.*

There's much more to tell, so write us and ask about the Series 6700 Power Derrick.



Series 6700 Derrick mounted on Holan CLC-138 Construction Body. Notice new Holan corner window design for crew compartments.

All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

Service bodies for chassis up to 1½ ton. Lengths, 72", 84" and 102"

Aerial arm for spotting workmen 37 feet above ground, 9 feet below ground level. Double-basket unit extends 45 feet. Rotates 360°

Live-boom, three-legged derrick lifts 12,000 lbs., 75-foot poles. Body-loads 5,000 lbs.

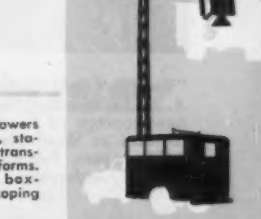
Mechanical Ladders expertly engineered and counterbalanced for effortless handling. Maximum heights from 24' to 32'. Swings 360°; angles to 72°

Portable hydraulic and mechanical earth borers. Augers for 8" to 20" diameters, depth to 8'

Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Live-boom, two-legged derrick with fabricated, rectangular side legs—"bow-legged" design. Lifts 8000 lbs., 65-foot poles.

Live-boom, two-legged derrick with automatic hydraulic side-leg coupling. Lifts 6000 lbs., 70-foot poles.



Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
CLEVELAND 11 OHIO

OTHER PLANTS

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BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

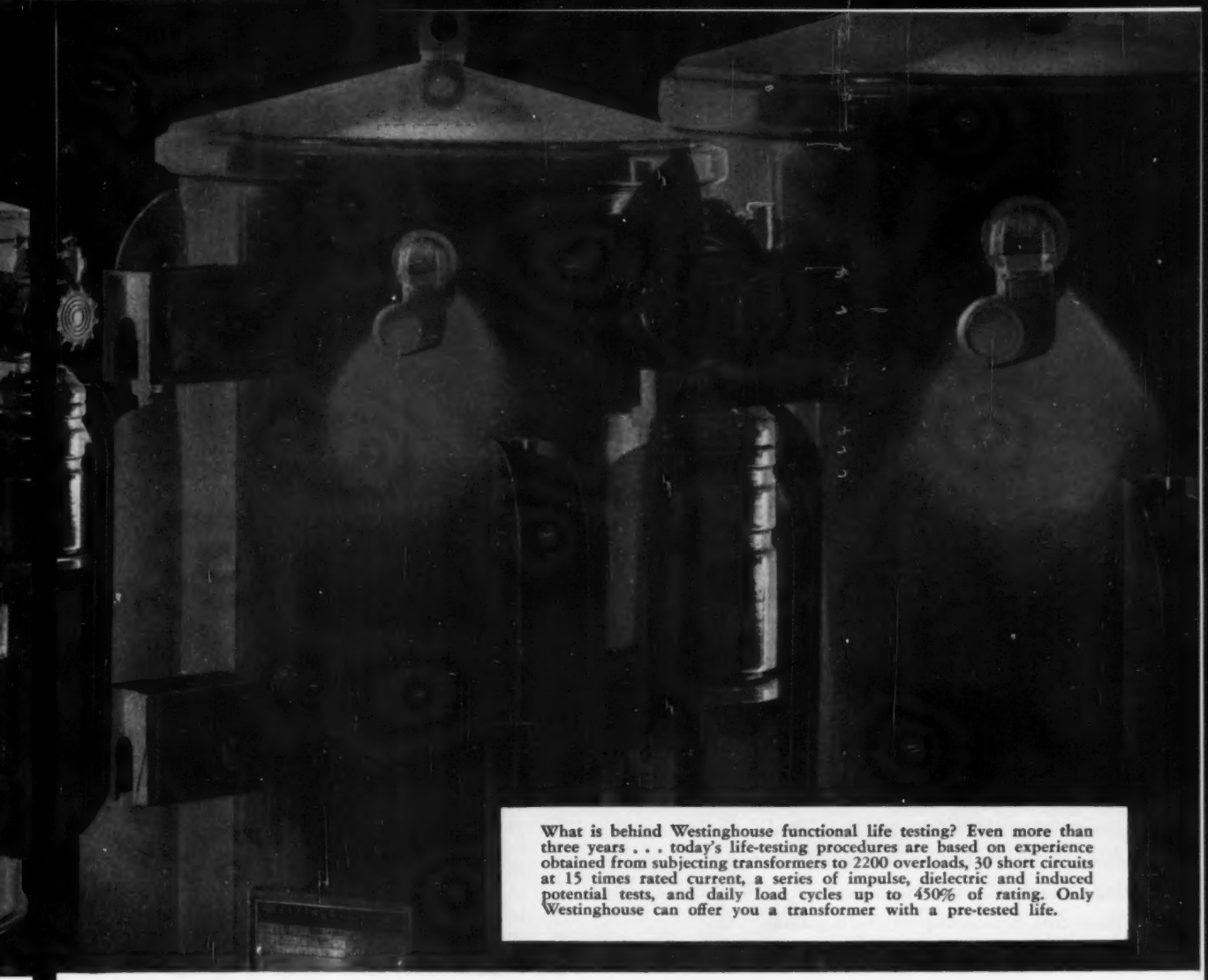
The transformer that

"You can't test transformer life by just testing insulation," says A. M. Lockie, design engineer, who has developed the unique, new concept of functional life testing of distribution transformers at Westinghouse. For full description, see Lockie's AIEE papers, *Functional Life Expectancy Tests for Liquid-Filled Transformers* (55-520 and 53-243).

ACCELERATED LIFE-TESTS-TO-DESTRUCTION PROVE 20% INCREASED OVERLOAD CAPACITY OF WESTINGHOUSE TRANSFORMERS SAVE UTILITIES OPERATING DOLLARS

The new Westinghouse transformers already have a lifetime of success behind them. How is that possible? Through a revolutionary new concept of proving performance . . . a new concept in determining transformer life. This means that the new Westinghouse Type S and CSP® transformers have demonstrated in advance a phenomenal life expectancy in service.

Normal breaker settings on Westinghouse CSP transformers have been increased 20% — an additional 15% in the emergency range. The functional tests have demonstrated that this major increase in load capability has been achieved without sacrifice in normal life expectancy... an exclusive Westinghouse development.



What is behind Westinghouse functional life testing? Even more than three years . . . today's life-testing procedures are based on experience obtained from subjecting transformers to 2200 overloads, 30 short circuits at 15 times rated current, a series of impulse, dielectric and induced potential tests, and daily load cycles up to 450% of rating. Only Westinghouse can offer you a transformer with a pre-tested life.

lived 30 years in 3...

Proof? Here is proof never before applied to a distribution transformer. Complete transformers — not insulation alone, or subassemblies — but complete units have been put through repeated cycles of overload up to 350% of rated load. These tests were conducted under conditions representative of actual service. Aging was accelerated 10 times; 30 years of "normal" life were packed into three. Without a single failure, these transformers also survived periodic impulse, short-circuit and low-frequency dielectric tests.

And check-on-check proof . . . 10,412 Westinghouse transformers have operated successfully up to three years at the higher operating levels on distribution lines of three utilities in New York, Missouri and Texas. In 1954, 1955, 1956, these transformers lived through not only tough load cycles but also severe heat storms — and still delivered a caliber of service never equaled in a transformer.

The result? Reliability of Westinghouse transformer ratings has been conclusively established. This is "functional life testing" at Westinghouse. By giving a few transformers a short and rugged life test, Westinghouse can assure you that the many you buy will have a long and predictable life . . . give you long and dependable service. Specify Westinghouse.

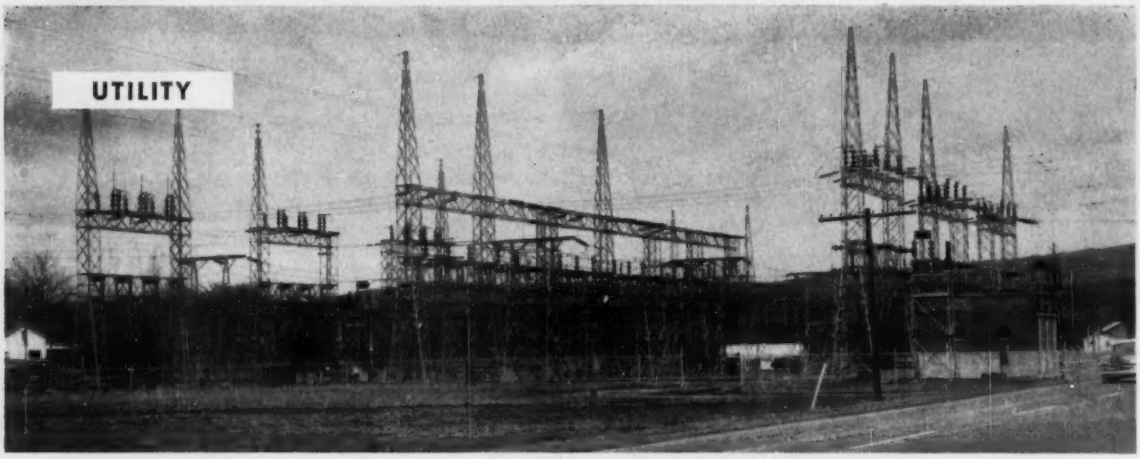
Call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-70777

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN

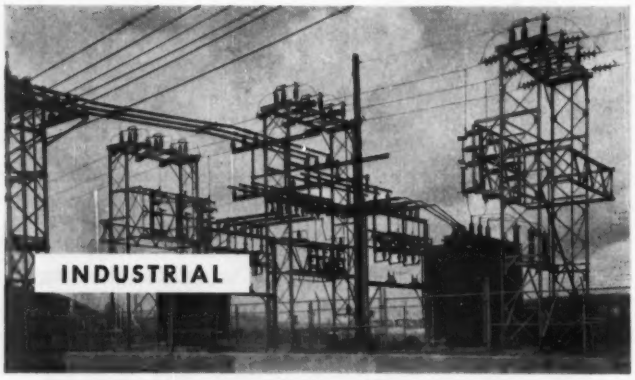
ON CBS TELEVISION AND RADIO!

R&IE Unified Responsibility for...



OUTDOOR SUBSTATIONS

From Layout to Line—the R&IE Unified Responsibility for all structure and switching problems is your assurance of a properly designed, well coordinated substation. Either a transmission structure or a service entrance industrial structure, simple or complex, is carefully developed with an aim to maximum operating economy at the lowest cost. "Under one roof" R&IE controls design, fabrication, application and manufacture of blade switching equipment, and shipping. Now is the time—during these cost conscious planning days—to place your problems with R&IE.



DESIGN—The problems of electrical clearances, efficient switching arrangements, wind stress, wire pull, weather, air contamination—all have been studied and solved for over forty years. Take advantage of this experience.

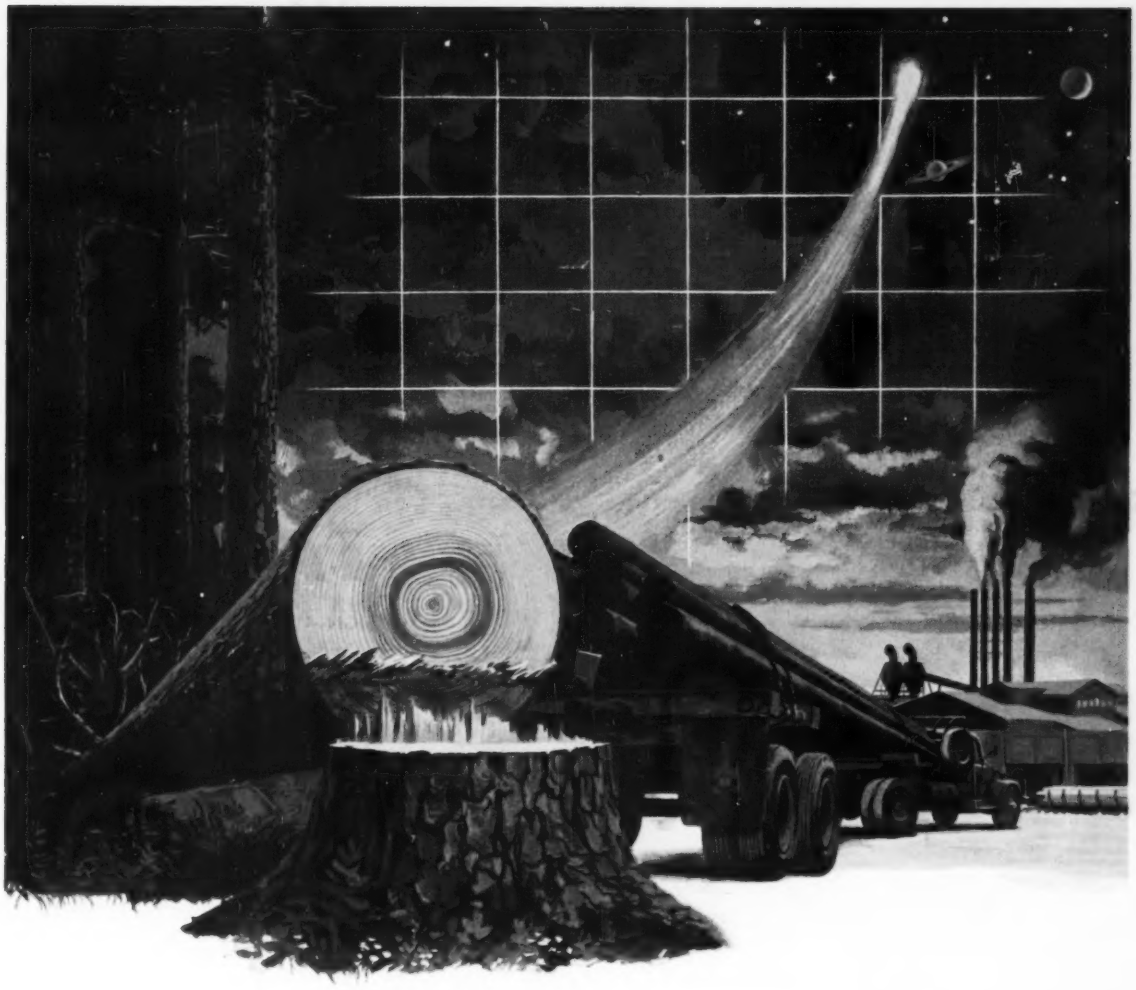
DETAILING—Development of single line diagrams by R&IE experienced draftsmen, detailers, and checkers—gets the job into fabrication sooner, and provides for clean cut, understandable drawings that you can clearly read as the job you want.

FABRICATING—R&IE fabricating facilities are modern and efficient—with time-saving automatic spacing and punching equipment, straightener and bending machines, power shear cutters, and galvanizing facilities—all operations resulting in neatly packaged, well marked substation members that will go together properly on the erection site.

APPLICATION OF BLADE SWITCHING EQUIPMENT—The relation of substation production and the building of air-switches is important—when both are handled "under one roof." With over forty years' design know-how, R&IE equipment application engineers have pioneered many switch features which are today's standard of the industry.

R & IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER COMPANY
GREENSBURG, PA.

R&IE



a major advance in pressure-treated pole production

by OLIN MATHIESON

Keyed to the soaring growth of America's public utilities, Olin Mathieson has now expanded its FROST pressure-treated pole operation to major proportions by the purchase of additional plant facilities.

The FROST operation of Olin Mathieson is managed as a modern, fully-integrated program — from vast forest reserves to pressure-treating facilities. Olin Mathieson's inflexibly high standards assure unexcelled quality in product and service.

Planning-in-depth, constant-cycle harvesting and high operating efficiency enable FROST to offer a complete selection of pressure-treated poles for prompt shipment to any destination. FROST efficiency stands ready to eliminate your planning and inventory problems.

Frost

FOREST PRODUCTS DIVISION

OLIN MATHIESON

CHEMICAL CORPORATION

SHREVEPORT, LOUISIANA

malleable **iron** lengthens life of pole hardware *without increasing cost!*

MIF high corrosion resistant malleable iron pole hardware costs no more — and often less — than mild steel . . . and far less than special, low alloy, premium priced steel hardware.

Write for further information about MIF Longer Life pole hardware.

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

MIF

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. JSG Electric Co., Chicago, Ill., Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla., E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mic'

Progressive engineering

makes Nordberg Engines your logical choice for power generation

Nordberg, a pioneer in the Diesel and Gas engine industry in the United States, has always occupied a prominent position among the world's leading builders of internal combustion engines. Over the many years Nordberg has contributed many of the most notable advancements in the development of more efficient prime movers . . . all in the interest of improved fuel economy, simplicity of design, less maintenance and better overall performance.

Nordberg research, engineering and development continues to direct its efforts toward further achievements by intelligently anticipating power requirements. As a result of these efforts Nordberg today . . . with a full range of engine sizes from 10 to over 12,000 horsepower including Diesel, Duafuel® and Spark-Ignition Gas types . . . is in the best position to solve your specific power problems.

Write for further information.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

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P156

. . . at no additional cost

Every Central distribution transformer, 100 KVA and below, is impulse tested on the production line. This – the last inspection step before shipment – is preceded by all standard NEMA and ASA tests. Precision manufacture and rigid inspection without premium costs are important reasons why more and more Central transformers are specified. Your inquiries are invited.

Designers and Manufacturers of Transformers Only

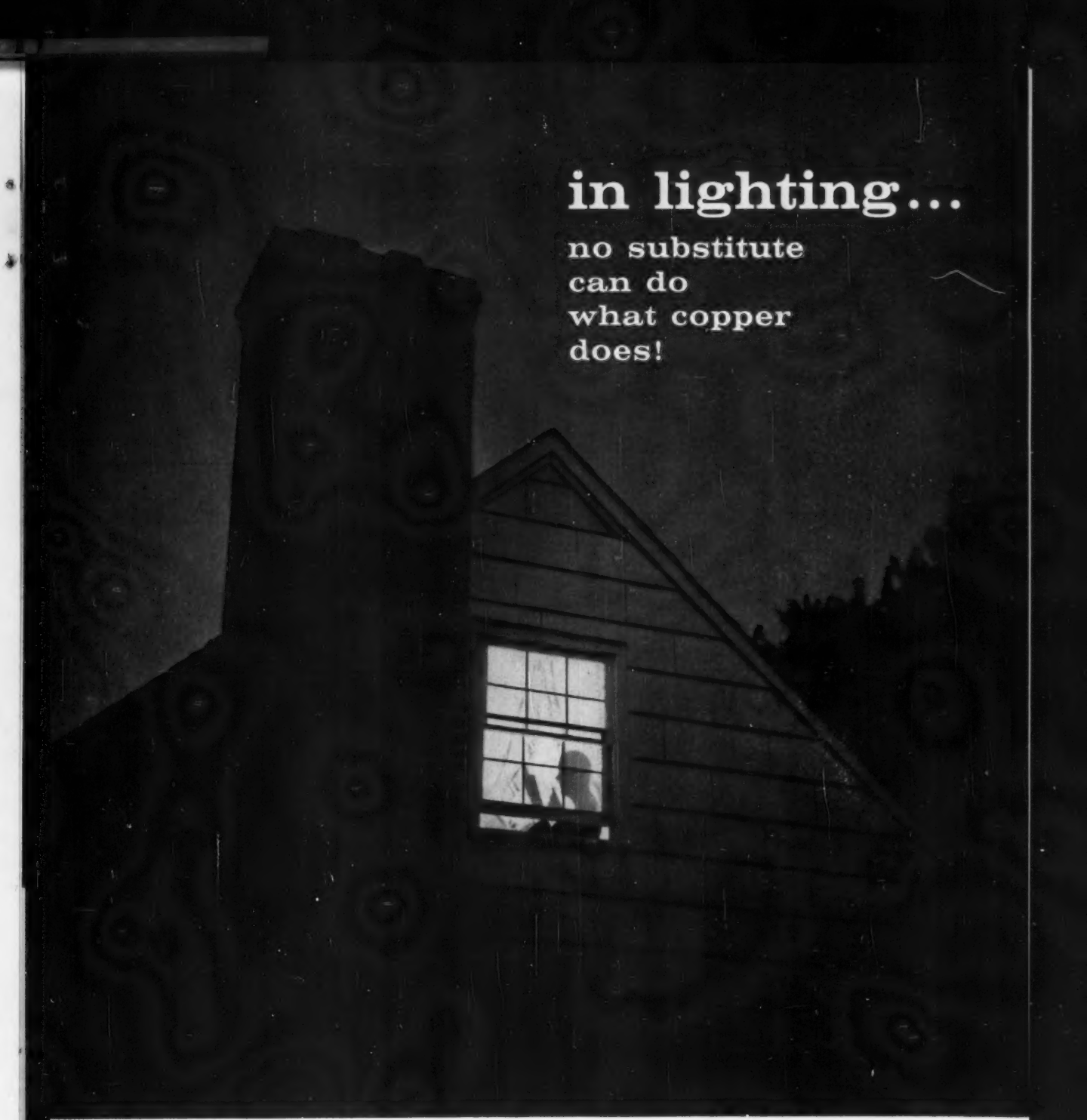
Central TRANSFORMER CORP.

PINE BLUFF, ARKANSAS *Sales Offices in Principal Cities*

NEMA

cTc

A TYPE FOR EVERY NEED . . .
FROM THE SMALLEST TO THE LARGEST

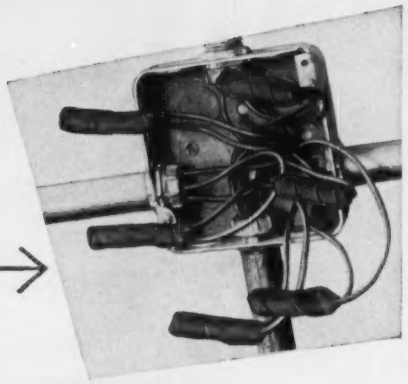


No other non-precious metal carries electricity as well as copper. No other conducts heat as well and at the same time is more resistant to rust, corrosion and wear. In the manufacture of electrical equipment, copper or copper alloys combine, better than other metals, the vital properties of malleability, ductility, and machinability. In lighting, as in so many other fields, there is no substitute with all the qualities of copper – most versatile of metals!

Kennecott Copper Corporation

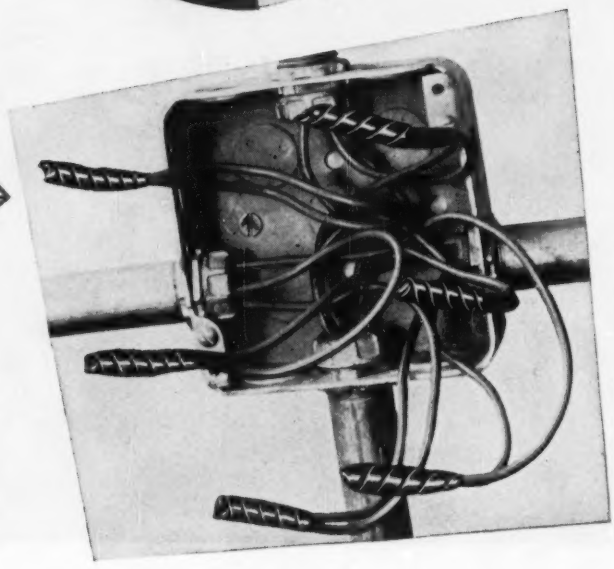
Fabricating Subsidiaries: Chase Brass & Copper Co. • Kennecott Wire and Cable Co.

Avoid this



use this

for results like this . . .



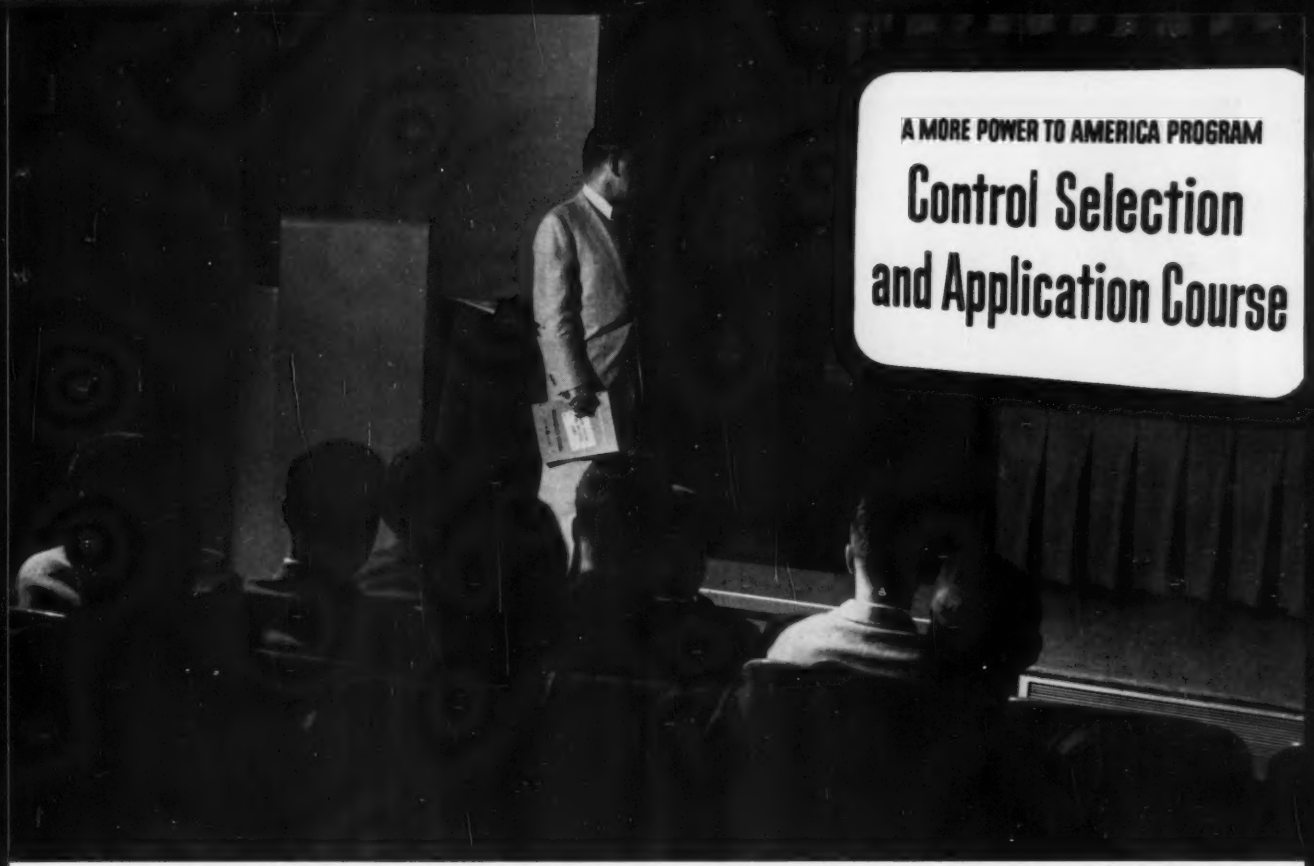
For neat, sure insulation without bulk, use Porter vinyl electrical tape. One operation does the job. No outer wrapping needed. Dielectric strength stands up to high voltages. Resistant to acids, water, corrosion. Conforms readily to curves. Retains adhesion under toughest service conditions. Ideal for production line and maintenance work. Order from your Quaker distributor.

Porter Vinyl Electrical Tape carries Underwriters' Laboratories Inc. seal

HKP
H. K. PORTER COMPANY, INC.

QUAKER RUBBER DIVISION
PHILADELPHIA 24, PA. • SAN FRANCISCO 7, CALIFORNIA

H. K. PORTER COMPANY, INC.



New General Electric slidefilm program teaches "three R's" of electrical control

Theory, selection, and application of electrical controls in industry explained in new sound-color slidefilm course

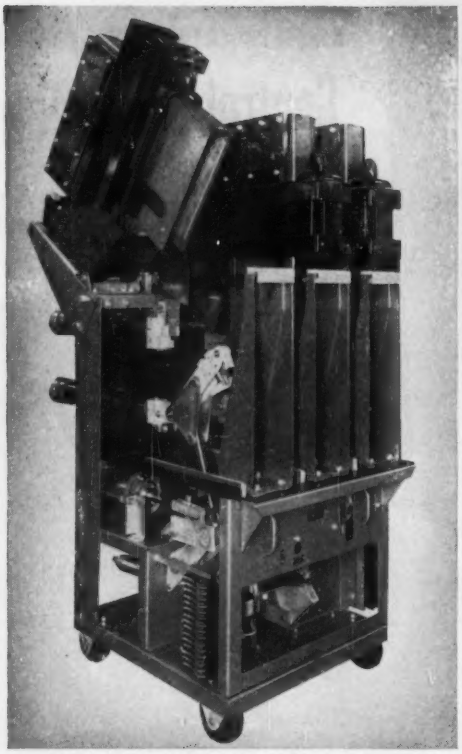
Your Training Program can use this new More Power to America slidefilm training course—which simplifies teaching the theory and application of electrical control. The course begins with basic electrical control concepts and progresses through the latest phases of automatic control. The Control Selection and Application Course is a complete, easy-to-use educational tool, professionally produced to provide a better understanding of this important subject. **The More Power to America** program, to which this course is the newest addition, is a continuing program to help industry increase productivity, and decrease costs through the application of modern electrical principles.

For a Preview of the control course, contact your local electric utility or your nearest General Electric Apparatus Sales Office. For a free copy of the new catalog describing other More Power to America film programs, write General Electric Co., Section 350-6, Schenectady, N. Y.

COURSE INCLUDES carrying case, eight 35-mm slidefilms, eight 33⅓ rpm records, descriptive booklets and instructors' manual. Price is $70.

MORE POWER TO AMERICA

GENERAL ELECTRIC



ROLLED AND MOLDED ARC CHUTE SHELLS, made by C-D-F for the I-T-E Circuit Breaker Company for 7.5 and 15 KV air magnetic circuit breaker, are good examples of paper-base Dilecto doing a hard job. Each completely closed insulating shell (NEMA grade X) has flame-retardant construction, negligible water absorption, and high dielectric strength at all points to withstand impulse test requirements.

High strength, low cost...

C-D-F paper-base Dilecto®

Excellent electrical properties, ease of machining and punching, with low costs are features of the many paper-base grades of Dilecto laminated plastics. Adaptable to forming, Dilecto is a mechanically versatile insulating material that withstands difficult operating conditions, moisture and temperature variations.

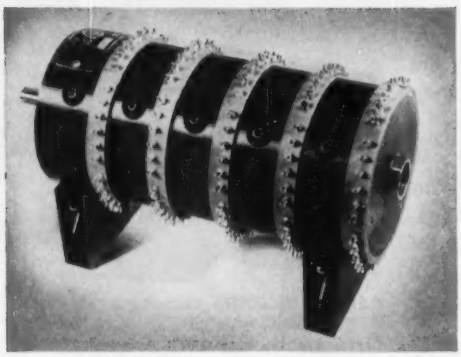
Insulating papers include kraft-alpha, cotton rag, and asbestos. Improved phenolic, or melamine silicone laminating resins are used. C-D-F builds flame resistance into a paper-base laminate—you get a worthwhile, easier-to-machine substitute for a glass-base laminate. C-D-F bonds copper uniformly to Dilecto — you get a superior metal-clad laminate for printed circuit applications.

A big, reliable source of supply, C-D-F helps you improve design, simplify purchasing, speed production. Look in C-D-F's catalog in the Product Design File (Sweet's) for the address of your nearest C-D-F sales engineer. Write for samples and new Dilecto catalog:

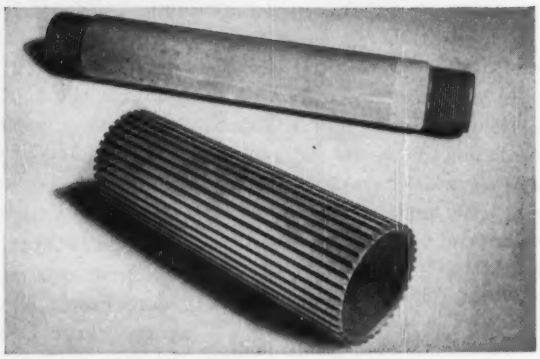
CDF **CONTINENTAL DIAMOND FIBRE**

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 15, DELAWARE



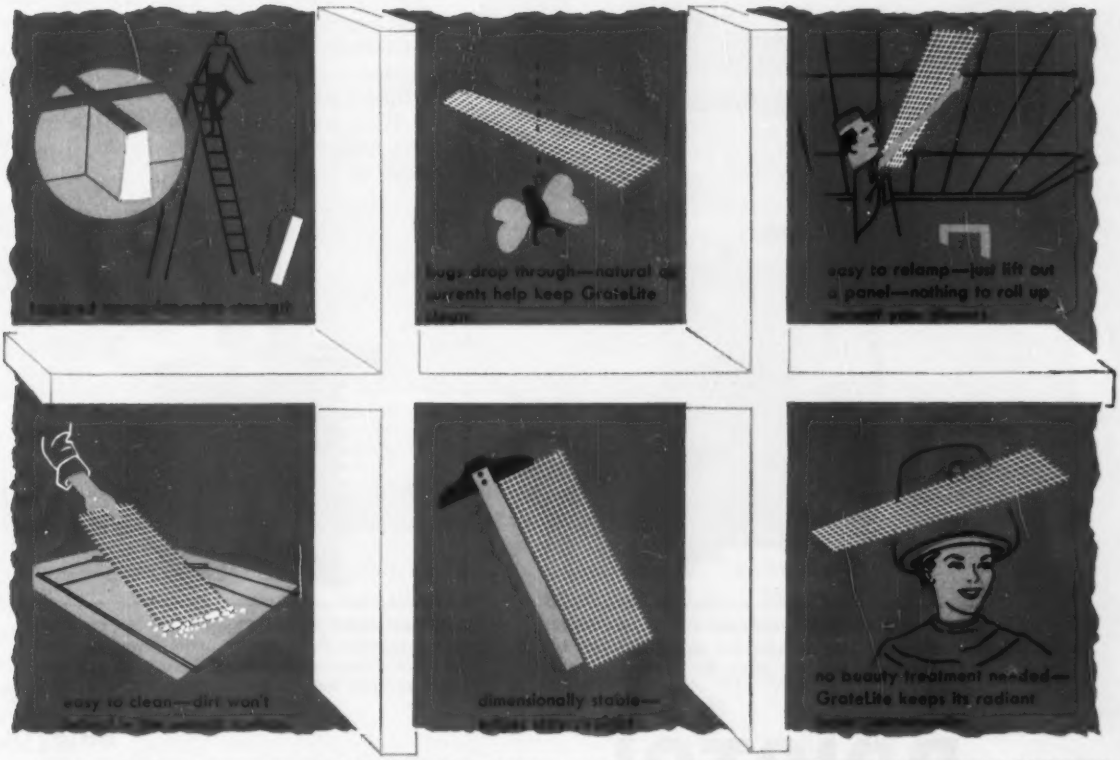
THIS HIGH-SPEED SAMPLING SWITCH, for missile telemetering and automation applications has a paper-base Dilecto tubing body. Materials engineers at General Devices, Inc., selected Dilecto "for its mechanical properties and low moisture absorption."



ACCURATE MACHINING, SMOOTH FINISHING are two merits of paper-base Dilecto. Note the perfection of milling cuts and threads! C-D-F has mass-production equipment, or can furnish sheets, tubes and rods with cost-cutting machining information.

GRATELITE* STAYS GOOD AS NEW year in-year out...

needs no babying...


bugs drop through—natural air currents help keep GrateLite clean
easy to relamp—just lift out a panel—nothing to roll up
easy to clean—dirt won't
dimensionally stable—
no beauty treatment needed—GrateLite keeps its radiant

CEILINGS OF GUTH GRATELITE LOUVER-DIFFUSER **GIVE BETTER LIGHT LONGER**

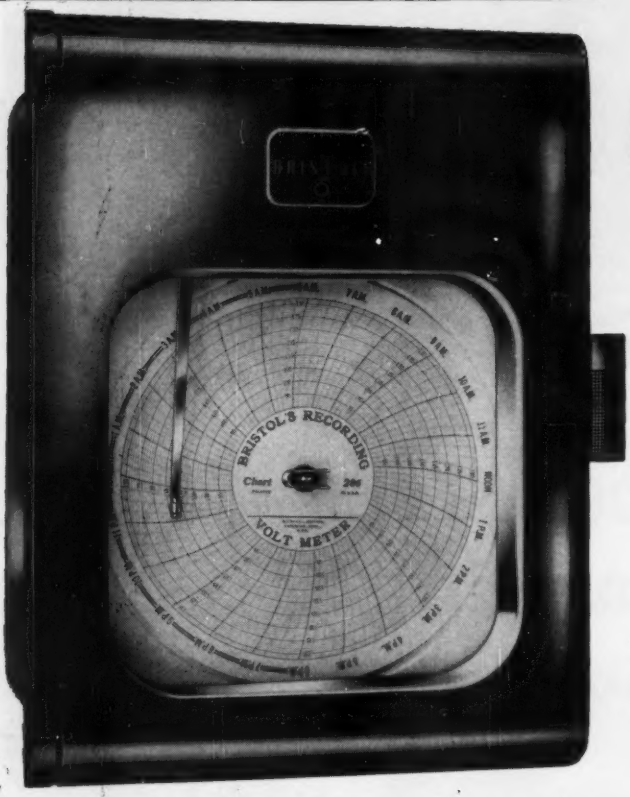
MAY WE SEND YOU DETAILED INFORMATION?

THE EDWIN F. Guth COMPANY • ST. LOUIS 3, MO.

TRUSTED name in lighting since 1902

*®U. S. Pat. No. 2,745,001
Canadian Patent Pending

WHAT'S NEWS AT BRISTOL . . .



PERMANENTLY MOUNTED Bristol Voltmeters and Ammeters come in three models: interchangeable surface and flush, surface-panel, and flush panel.

How do you pick the right recording ammeter or voltmeter?

The *right* choice for any voltage or current measurement and recording job is a Bristol Series 500 instrument.

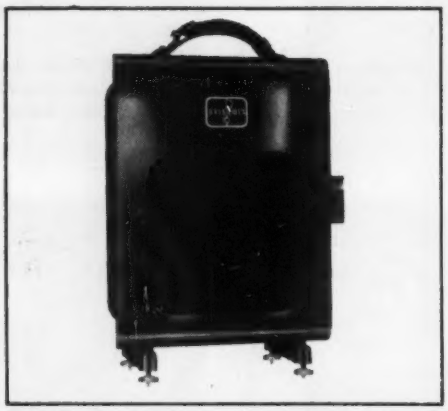
Why Bristol? Mainly because for sheer accuracy the Bristol Recorders can't be topped. Among the reasons for that are:

1. Low burden – the lowest burden of any round-chart recorder on the market.
2. Extremely high torque gradient.
3. Temperature compensated.
4. Shock-proof moving element mounting.
5. Leveling of instrument not critical.
6. Continuously legible recording of sudden changes – up to full scale value.

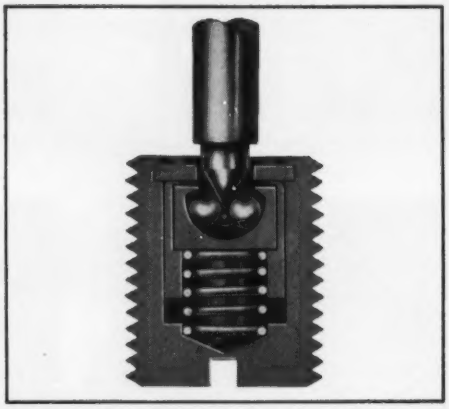
Also, Bristol's Series 500 Voltmeters and Ammeters are designed for easy use, with dust- and moisture-proof cases; quick-set chart hub for each chart changing; and snap-on chart plate.

Models offered that comply with ASA Specification C39.2.

Want more facts? Write for Bulletin E1111 to the Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 5.19



SINGLE AND TWO-PEN PORTABLE BRISTOL RECORDERS are offered in two models: one chiefly for portable pole mounting and the other for general portable service.



NEW BALL-BEARING SUSPENSION, loaded by a coil spring, prevents damage even under severe mechanical shock. Corrosion-resistant stainless steel ball bearings are almost tool-hard.

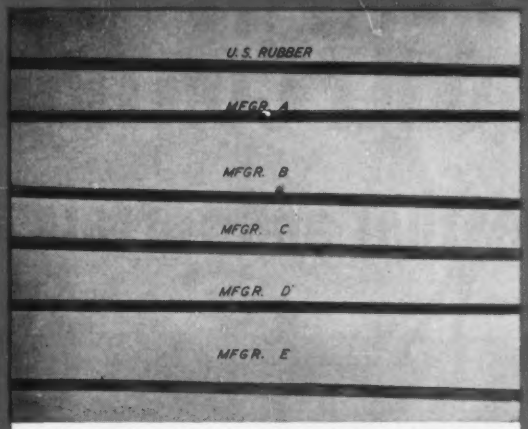
BRISTOL

TRADE MARK BRISTOL'S REG U.S. PAT OFFICE

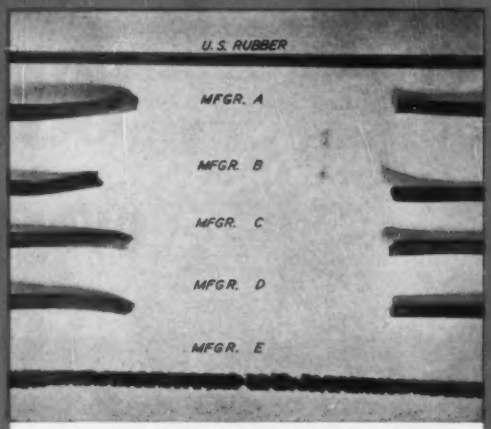
POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

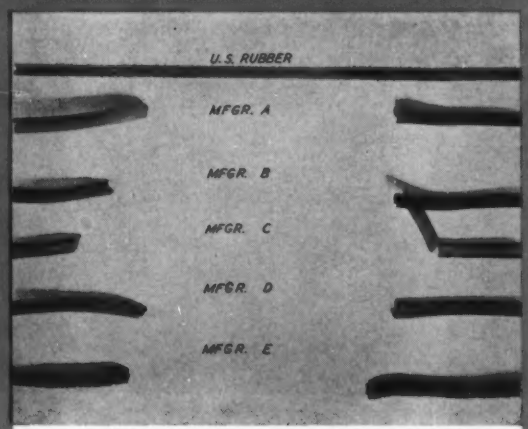
Grizzly High Voltage Power Cables



Here are 6 samples of widely used competitive neoprene jackets (stretched 200% of original length) at start of test for ozone resistance.



2 hours, 23 minutes after start. Brand "E" is disintegrating. Brand "B" has failed 13 minutes ago; the other brands failed an hour or more before.



Taken 7 hours after start of test—Brand "E" failed after 2 hours, 30 minutes. U. S. Grizzly Power Cable's jacket showed practically no sign of damage. It did not fail until after 18 hours of exposure.

Proved far and away the winner in an Ozone test of 6 leading competitive jackets!

U. S. Grizzly® High Voltage Power Cables are unmatched in performance, durability and all-around economy. Order these superior cables from your "U. S." branch, distributor or write Electrical Wire & Cable Department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

Obsolete wiring can cause power failure, step up expense and push down your production. That's why it's important to make sure your plant is equipped with Adequate Wiring—adequate not only for today's needs but also for the increased electrical loads needed in your future growth.

Electrical Wire & Cable Department

United States Rubber

every day – or in emergencies...

YOUR ONLY CONTROL

over weather and terrain

There are no normal work conditions in line work. Sunshine or sleet, sand, mud or snow, hill or hollow . . . they're all in the day's work. The only control you have over weather or terrain is a Four Wheel Drive truck!

FWDs ask no questions. They just get there and do the job. The new FWDs are fast and flexible for scattered line maintenance jobs. They're rugged and dependable for tough line construction assignments.

You can choose the type of body that fits your requirements and the power and weight proportioning that's best for your terrain. There are front or rear-mounted derricks and diggers with power take-off designed for utility tools.

This is the truck that's as dependable as your service has to be. Efficient for the day-to-day jobs but with a priceless power reserve for emergencies. Find out how the versatile new FWDs fit your service requirements!

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

MATH-O-MATIC DESIGN

THE FOUR WHEEL DRIVE COMPANY • CLINTONVILLE, WISCONSIN • *Canadian Factory* • KITCHENER, ONTARIO

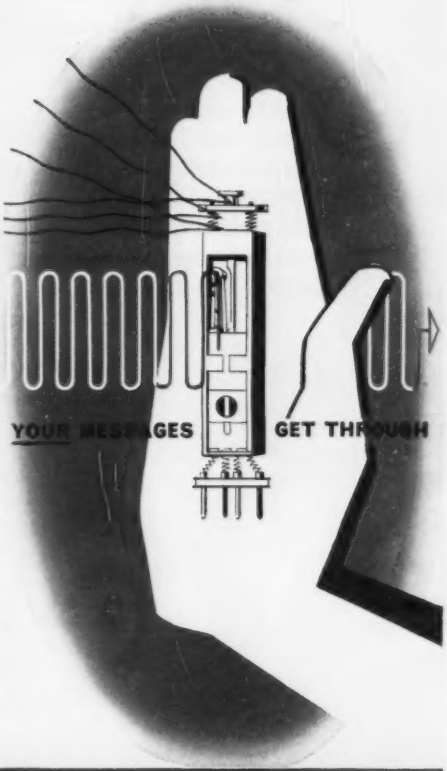
Triumph over Channel Chatter

with PRIVATE-LINE 2-Way Radio

GIVES YOU GREATER RANGE, MAXIMUM PROTECTION AGAINST NUISANCE AND SKIP INTERFERENCE

Truly a new dimension in two-way radio communications—the result of years of extensive engineering and "on-the-job" field testing. PRIVATE-LINE radiophone incorporates an entirely new circuitry concept which provides privacy from interfering signals and unwanted co-channel messages. Now you can "get off the party line." No longer is it necessary to listen to a constant stream of "channel chatter" over the loudspeaker. PRIVATE-LINE radiophone is *completely quiet* except when receiving a call from another PRIVATE-LINE radiophone in the same operation.

- **REDUCES MISSED AND MISUNDERSTOOD MESSAGES**—operators hear only messages within their own operation—minimizes confusion, inattention.
- **INCREASES OVERALL EFFICIENCY**—fewer errors mean more productive utilization of time—fewer repeat messages—more dispatched vehicles per hour...real advantages during peak load periods.
- **INCREASES AREA COVERAGE**—"coded squelch" circuit automatically maintains optimum receiver sensitivity, assuring maximum communications range at all times—prevents desensitization of the receiver by accidental or intentional misadjustment.
- **EASIER TO OPERATE**—no additional buttons, lights, adjustments or operational techniques—elimination of squelch adjustments makes PRIVATE-LINE even simpler to operate than conventional two-way radio equipment.
- **REDUCES OPERATOR FATIGUE**—elimination of "channel chatter" enables operator to concentrate on his job—reduces tension, providing a more pleasant atmosphere—increases job satisfaction.



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COMMUNICATIONS & ELECTRONICS, INC.

Private-Line

MOTOROLA Communications & Electronics, Inc.
4501 Augusta Blvd., Chicago 51, Ill.

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☐ Have a Radio Engineer call on me

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The only complete radio communication service—by the outstanding leaders of the industry

Wire Sculpture by Henry Szafarz

It's Another World . . .

one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

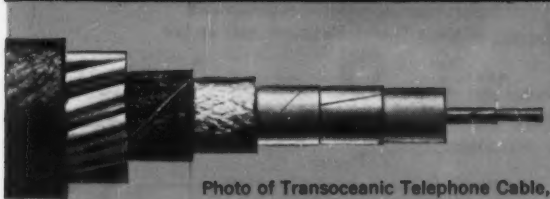


Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

Simplex

70% STRONGER IN COMPRESSION
1000% MORE RESILIENT
30% LIGHTER

New Westinghouse reactor rated a hands-down winner

Remarkable Westinghouse polyester-glass is stronger, more resilient, more versatile by far than any material ever before used in reactor cleat construction. Stronger, less bulky, and with greater dielectric strength, for instance, than conventional concrete. Cleats are bonded into solid vertical columns by high-strength resin tie rods, another Westinghouse innovation. Equally serviceable indoors or out, polyester-glass is impervious to moisture or any other atmosphere condition. In short . . . damage, aging and therefore maintenance are all but eliminated.

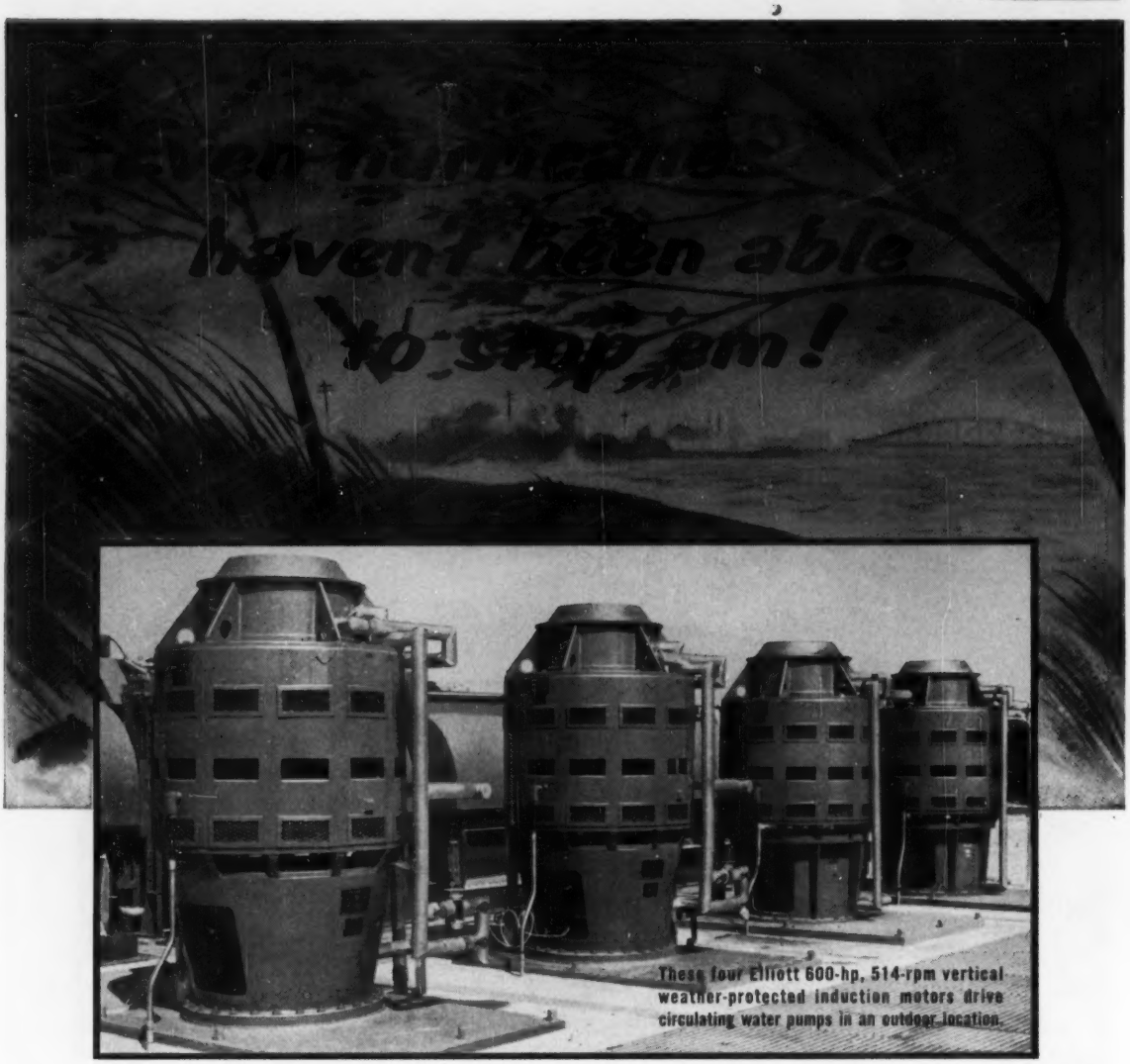
All facts. Tough facts, too, but look what current-limiting reactors have to put up with. Forces generated by short circuits and by expansion and contraction of conductors under heavy overloads subject equipment to terrific thermal and mechanical shock.

In the battle of the short circuits the new Westinghouse dry-type reactor is a hands-down winner. For more facts, get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70774

The six columns of a typical Westinghouse reactor have the compressive strength to support the weight of the largest power transformer ever built . . . 365,000 lbs.

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TV AND RADIO!



These four Elliott 600-hp, 514-rpm vertical weather-protected induction motors drive circulating water pumps in an outdoor location.

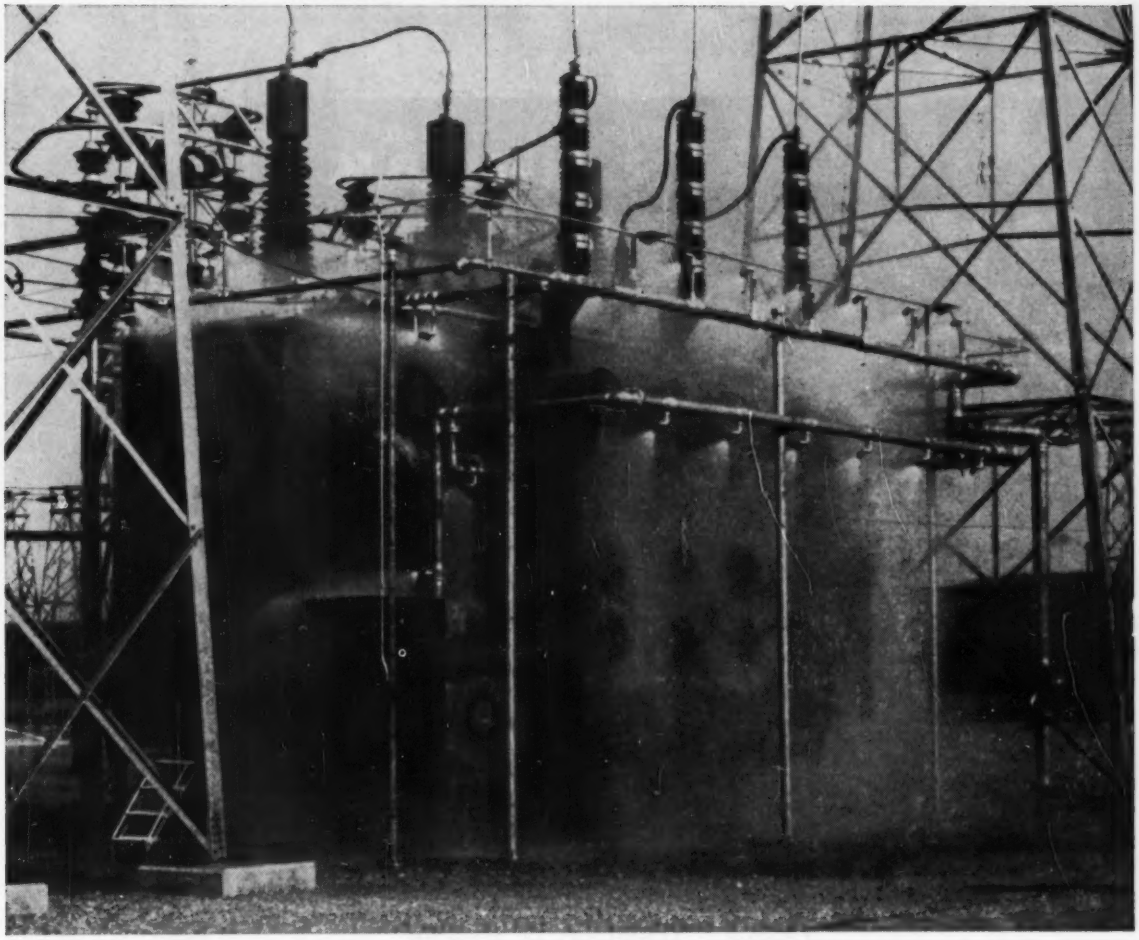
ELLIOTT *Weather-Protected* MOTORS

SIX FULL-FLEDGED HURRICANES have hit these Elliott weather-protected motors in two years of service in a southern utility plant right on the Atlantic Coast. Winds of over 100 miles an hour swept the station, and a driving, blinding deluge of rain battered the installation from all angles. But the rain couldn't penetrate and stop the Elliott motors. They kept right on operating, snug and dry on the inside. Elliott's superior design has proven itself in every climate and weather condition you can think of—snow, sleet, salt spray, dust, mist, fog or wind-blown rain.

Elliott weather-protected motors are the safe, economical answer to many of today's drive problems, which could otherwise be met only by added building construction or a totally-enclosed motor. They need no roof, no cored foundations, no duct work, and present no difficult maintenance problems. Over 500,000 hp now in service. Ask your local Elliott field engineer or write for Bulletin PB 1400-6. Address Elliott Company, Ridgway, Pa.

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS



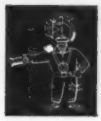
...give your equipment the best fire protection

a BLAW-KNOX automatic FOG SYSTEM

Engineered to give your transformers and other equipment positive protection against fires, a BLAW-KNOX *Automatic* FOG SYSTEM goes into action immediately:

- *smothers flames*
- *dissipates heat*
- *protects adjacent equipment*
- *prevents loss of revenue*
- *prevents service stoppage*
- *avoids customer complaints*

"Little Joey Sprinkler" always on the job



Why not give your equipment the BEST possible protection? Let a Blaw-Knox *fire-protection* Engineer study your needs. He will gladly submit a layout and a cost estimate . . . with no obligation to you.

A BLAW-KNOX Automatic FIRE PROTECTION SYSTEM for EVERY NEED.

50th Anniversary BLAW-KNOX 1906-1956

BLAW-KNOX COMPANY

Automatic Sprinkler Department/Pittsburgh 33, Pennsylvania

TECO

SINGLE POLE MOUNTED

AIR BREAK SWITCHES*

COSTS LESS TO INSTALL—ONE POLE INSTEAD OF FOUR!

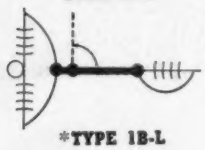
SIMPLE TO OPERATE!

Check THESE BENEFITS

PROVEN ON-THE-LINE SUPERIORITY...

The facts and figures of actual installations offer convincing proof that TECO is the preferable air break switch. Investigate.

TYPE 1B



*TYPE 1B-L

*TYPE 1B-R

REA Approved

Write for...

BULLETIN 501

or ask for specific technical information.

THE BEST COSTS NO MORE

TECO Air Break Switches provide:

√ **HI-PRESSURE CONTACTS NECESSARY FOR GOOD CONNECTIONS:** Rotary motion of blade prior to opening releases hi-pressure beryllium contacts at both ends of blade.

√ **DIRECT LINE TO LOAD CONNECTIONS:** No mechanical transfer of current thru braid, springs or friction washers. More positive connections.

√ **TECO POLE BANDS FOR TECO SWITCH MOUNTING:** Special heavy galvanized steel pole bands eliminates drilling holes in pole . . . prolongs pole life.

√ **SINGLE POLE INSTALLATION:** Cuts cost of pole and real estate and installation time.

√ **ONE-PIECE JAW AND TERMINAL OF BERYLLIUM COPPER:** Eliminates current transfer thru bolted areas.

√ **FOUR-BOLT CONNECTORS OF BERYLLIUM AND CAST COPPER:** Two range sizes: from No. 2 strand thru 400 MCM and 3/o thru 750 MCM.

√ **SEALED BEARINGS** are packed with special lubricant for lifetime service.

√ **NEOPRENE DUST AND MOISTURE SEALS** protect bearings at all points.

√ **HIGH CONDUCTIVE COPPER AND BERYLLIUM COPPER** are used for all current carrying parts to eliminate resistance.

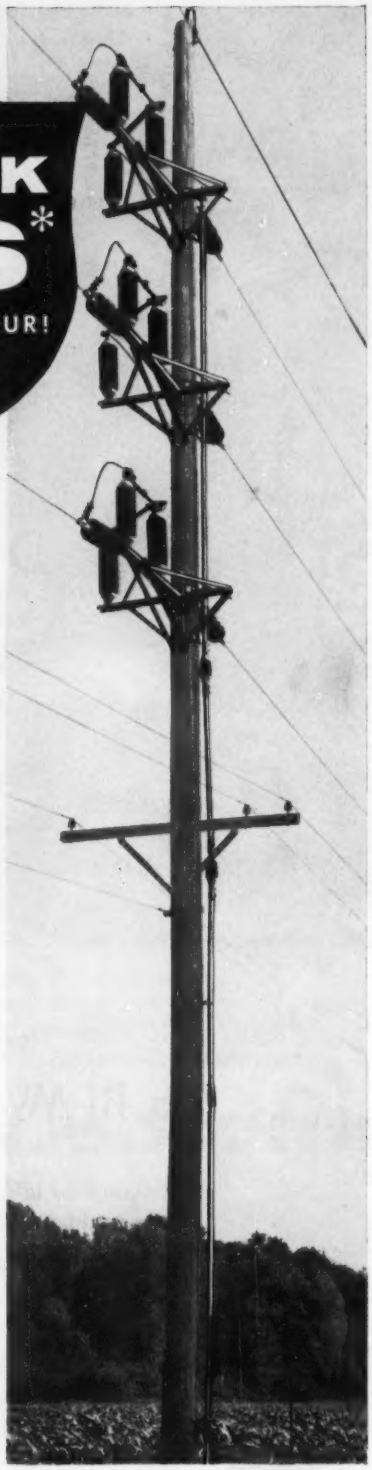
√ **DOUBLE SPRING TYPE ARCING HORNS:** This type of arcing horn has proven its remarkable ability to interrupt 69 KV. charging currents on long lines, and light transformer loads.

√ **ON THE JOB SAVINGS: TECO** Unit Air Switches are maintenance free thru years of service.

Type 1B **HORIZONTAL BREAK**
15 KV thru 161 KV

Made by the Makers of Flexi-Band Transformer Mount Racks and Capacitor Mount Racks. Literature available.

Some Territories Still Open for Representation.



ILLUSTRATED: 69 KV INSTALLATION

TURNER *Electric* CORP.

9510 ST. CLAIR AVENUE • EAST ST. LOUIS, ILLINOIS

NO MEASURABLE ERROR IN A 5 OERSTED FIELD!

Model 325 self-shielded D-C Laboratory Standard (1/10 of 1%)—an improved instrument now replacing the world renowned Model 5.

The new Weston model 325 provides a new STANDARD of laboratory measurement

Another WESTON first... a self-shielded primary instrument standard that is unaffected by magnetic fields normally encountered in the modern laboratory. While the new Model 325 incorporates a special CORMAG® mechanism, the overall design provides an even far greater degree of shielding than that inherent in the basic core-magnet mechanism. In fact, tests show absolutely no measurable error in a 5 oersted field. Thus there is no need for positioning or mounting the instrument with reference to the earth's field; nor to take undue precautions when using it in close proximity to current carrying conductors. In addition, Model 325 is well compensated for normal room temperatures; and a vernier type corrector is provided for precise and rapid zero adjustment. This improvement in primary instrument standards is another example of the *forward thinking* and *continuous development* which have kept WESTON the instrument leader since 1888. For complete data on Model 325, or on other Weston instruments consult your nearest Weston representative, or write... *Weston Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, N. J.* A subsidiary of Daystrom, Incorporated.

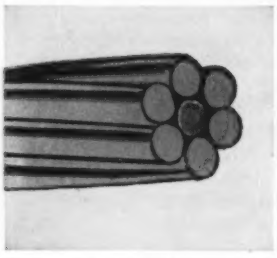
WESTON
Secondary Standards
(¼ of 1%)

A DAYSTROM UNIT

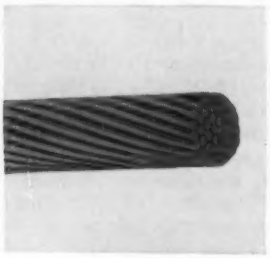
WESTON *Instruments*

Planning to use more Aluminum Cable?

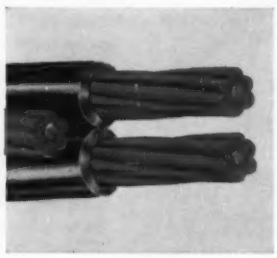
ANACONDA IS READY WITH THE BROADEST LINE IN THE INDUSTRY



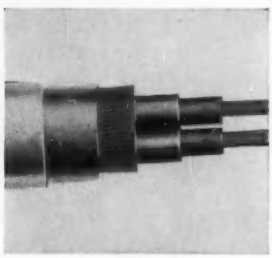
ACSR



Bare strand aluminum



Type N-SD



Silvaline*
Type SE service entrance

ASK THE MAN FROM

FOR

THE FACTS ARE PLAIN! No other company in the industry is prime producer and fabricator of *both copper and aluminum.* If you are considering aluminum, only Anaconda can give you the same fast service, quality products, cable experience and full-line choice in the white metal as you have had traditionally in copper. For Anaconda has:

1 *Broadest line of aluminum conductors in the industry* including bare aluminum and ACSR; Neoline*, Polene* and Duraline* line wire; Types SE, SD, N-SD and K service cables; aerial power cable; network cable; cathodic protection cable; and many others.

2 *Seven-mill service.* Anaconda has more mills producing aluminum wire and cable than any other manufacturer. Seven fabricating mills strategically located across the country assure speedy service.

3 *Electrical Distributors.* Anaconda Wire and Cable Company has several hundred electrical distributors located throughout the country who can expeditiously provide you with Anaconda products.

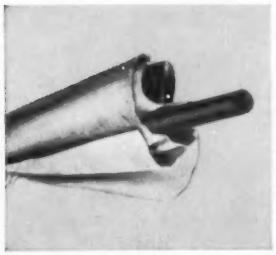
4 *Reduction plant* at Columbia Falls, Montana, gives Anaconda control over its aluminum production from reduction of alumina . . . to wirebar . . . to rod . . . to finished product.

5 *Insulated-cable experience* — in design, research, construction and quality control — helps Anaconda produce aluminum wire and cable with superior electrical and physical characteristics.

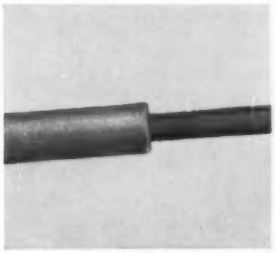
6 *Technical assistance.* Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem.

THE MAN FROM ANACONDA will be happy to help you. Backed by the broadest line of wire and cable in the industry in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 88303

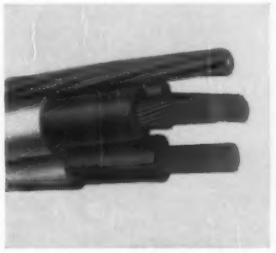
*Reg. U. S. Pat. Office



Duraline*



Neoline* and polyethylene line wire



Aerial cable

Type CP cathodic protection cable

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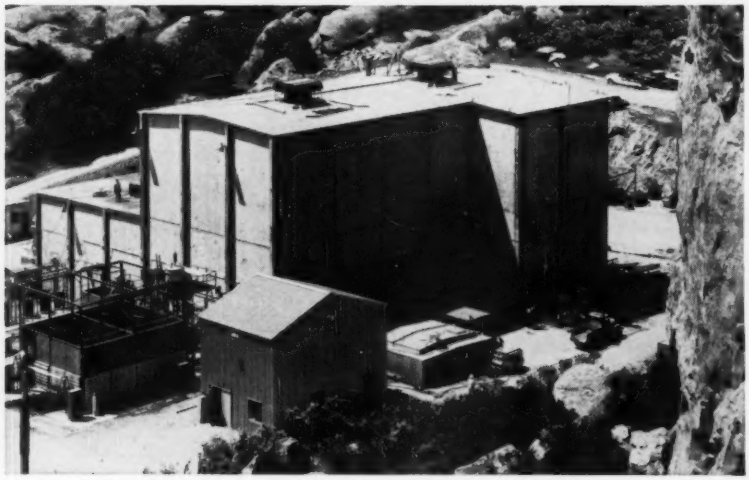
ALUMINUM WIRE & CABLE

"Advertisement"

NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

Nuclear reactors now being built for science and industry—for power and radiation

Within a single decade ATOMICS INTERNATIONAL engineers and scientists have developed a broad range of experience in the nuclear field through the design, construction and operation of a wide variety of reactors. This work includes four reactors completed and now in operation; four more reactors now in construction; and seven major engineering design projects completed.



Sodium Reactor Experiment nears completion in Santa Susana Mountains. It is being built and will be operated by Atomics International as a key part of AEC's nuclear power development program.

ATOMICS INTERNATIONAL, a division of North American Aviation, Inc., is a leader in the development of advanced reactor technology. A new power reactor concept, the Organic Moderated Reactor Experiment, is scheduled to be built by ATOMICS INTERNATIONAL for the Atomic Energy Commission at the National Reactor Testing Station in Idaho. This promising experiment will use an organic material—a carbon-hydrogen compound—in the dual role of moderator and coolant.

The diversified nuclear program at ATOMICS INTERNATIONAL includes:

1. Sodium Reactor Experiment. Located in Santa Susana Mountains, near Los Angeles. Fuel: either slightly enriched Uranium, or Thorium and U-233. Output: 20 Thermal Mw. Though experimental, the reactor will be equipped with heat exchanger and turbogenerator by Southern California Edison, who will feed 6.5 Mw of electric power to the surrounding area.

2. Full-scale Sodium Graphite Reactor Design. Fuel: same as above. Heat output: in the order of 250 Thermal Mw. Power Output: Uranium—75 Mw; Thorium—100 Mw; Thorium (after further development)—125 Mw. Capital costs, with full generating equipment, around $300 per Kw with Uranium, expected to be reduced with Thorium eventually to $200 per Kw. Power costs would thus decrease from 11.1 mills/kwh to 6.5 mills/kwh.

3. Water Boiler Research Reactor. Designed and built by ATOMICS INTERNATIONAL for use on Atomic Energy Commission research projects. Fuel: enriched Uranium. Power 5 watts. Flux: 10^{8}n/cm^2/sec (thermal). Experimental facilities include exposure holes, through-tube and vertical thermal column.

4. Livermore Research Reactor. For Atomic Energy Commission's laboratories at Livermore, Calif. A higher power version of the Water Boiler Research Reactor designed to operate at 500 W. These were the first two reactors in California.

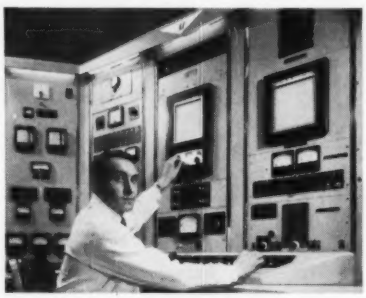
5. Medical Research Reactor. Designed for a southern California university. Fuel: Uranyl sulphate, highly enriched with U-235. Power: 50 kilowatts. Thermal neutron Flux: 1.7 x 10^{12}cm^2/sec. Provision for gamma intensities to 1.3 reb/min per kw, fast neutron intensities of 4 reb/min per kw; also utilization of pure gamma activity of fission gases. Excellent exposure facilities for patient therapy and biological research. First reactor specifically designed for medical use.

6. Industrial Research Reactor for Armour Research Foundation of Illinois Institute of Technology, Chicago. Similar to 5 above, with experimental facilities for industrial applications. This reactor is now operating on a planned schedule that includes "time" for participating companies. This is the first reactor designed specifically for private industrial research.

7. General Research Reactor for Atomic Energy Research Institute, Japan. Similar to the Armour and Medical Research reactors described above. This will be the first nuclear reactor in the Far East, and is slated to be completed in 1957.

ATOMICS INTERNATIONAL has complete designs for reactors with a variety of fuel moderator and cooling systems for various applications, and offers a complete program of services in connection with all reactor projects, including:

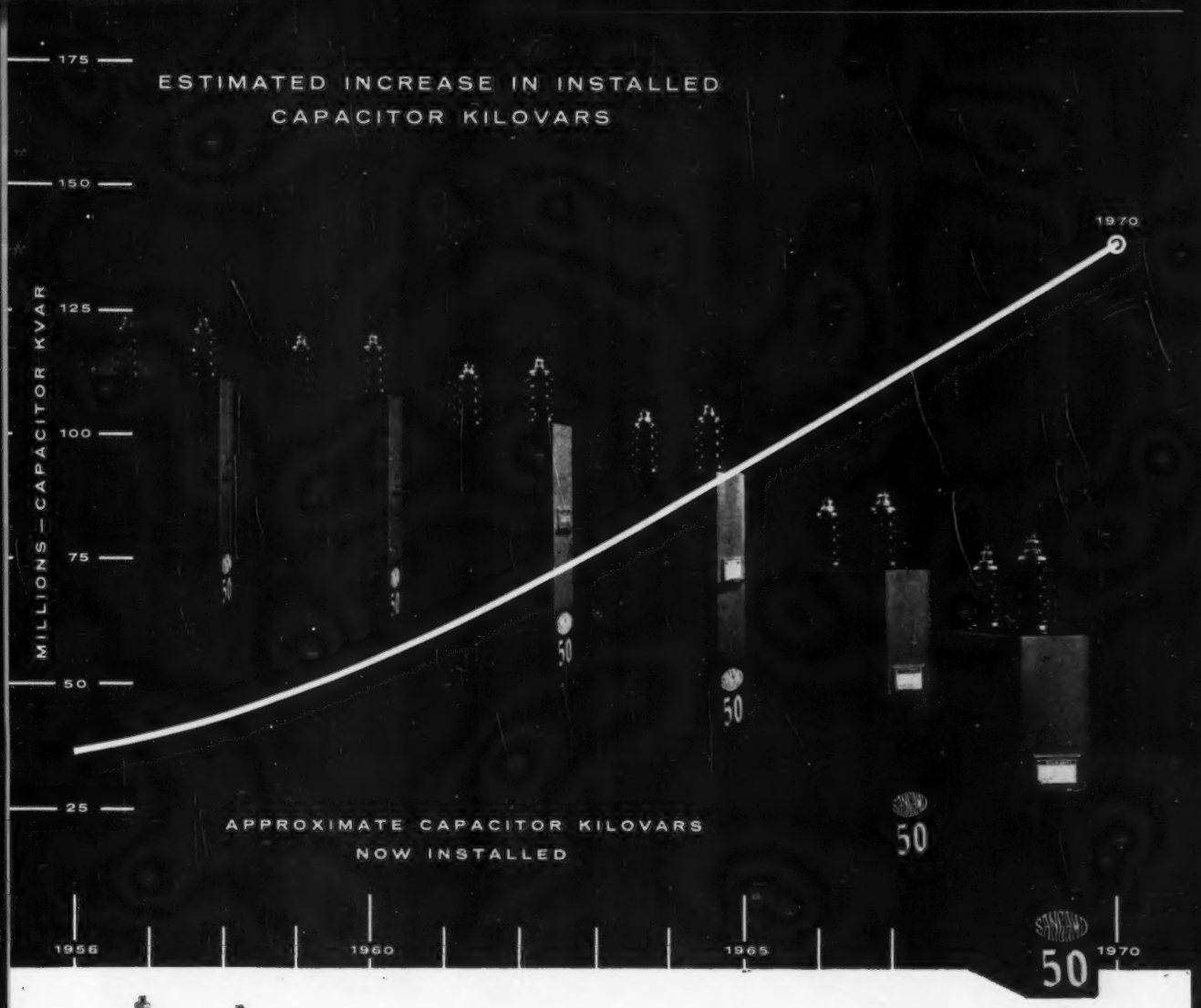
- Advice on most suitable reactor type for a specific use
- Assistance in reactor site selection
- Aid in meeting AEC requirements
- Coordination of reactor plans with building plans
- Installation supervision
- Training of operating and maintenance personnel
- Assistance in fuel loading and initial reactor operation
- Design counsel in later modification or expansion
- Assistance in public information



Dr. Marlin Remley of Atomics International activates Armour Reactor—first for private industry.

If you are interested in any phase of our activities, ATOMICS INTERNATIONAL is staffed and equipped to help you. Please write: Director of Technical Sales, Dept. EW-N5, ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, California. Cable address: ATOMICS.

AI **ATOMICS INTERNATIONAL**
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM



PC56-5

Plan low-cost kvar supply with Sangamo Capacitors

The tremendous growth facing the electric utility industry, and associated economic considerations, point up the need for near unity power factor operation at peak load. Your growing requirements for Kvar supply can be met adequately and economically with Sangamo Power Capacitors.

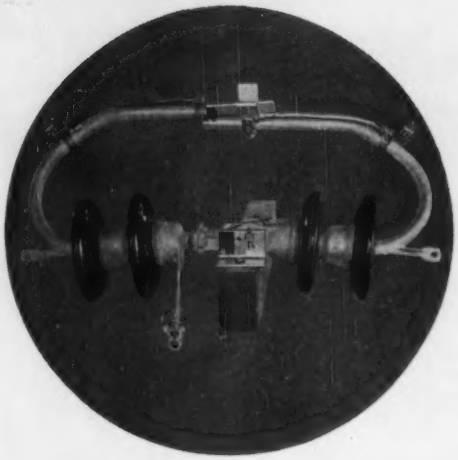
These capacitors are designed to the specifications of power engineers throughout the country. They are built in a brand new "controlled conditions" plant—under exacting Sangamo quality control through every step of the manufacturing process. They are thoroughly tested to help make sure that their service life is long and troublefree.

Sangamo Diaclor Power Capacitors are available in 25 or 50 Kvar ratings—of identical width and thickness—as individual units or in factory-assembled and wired Auto Var equipments for quick, economical pole top installation. All units are clearly marked to show Kvar rating. Get the full Sangamo Power Capacitor story. Ask your Sangamo Representative or write us today.

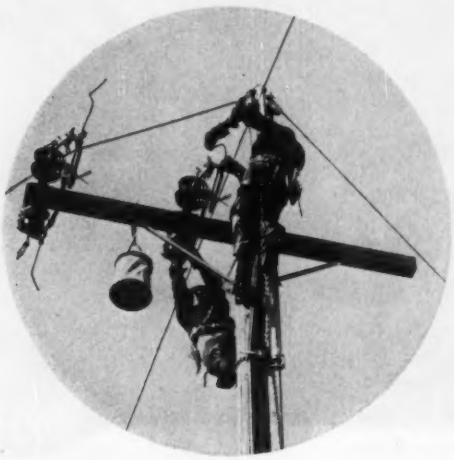
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

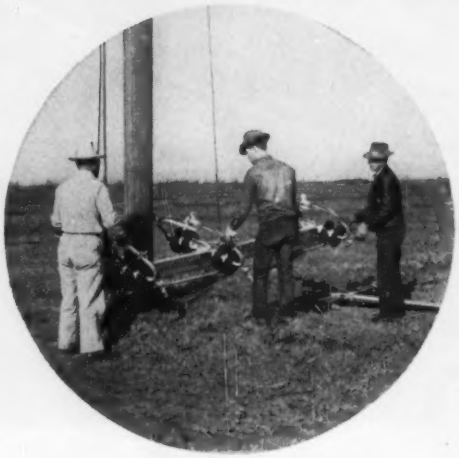
You can install KPF switches more quickly, at less cost, than any comparable switch. Just bore six holes in a single cross arm, mount, and connect. No precision requirements, no temperamental mechanism to bind, freeze, malfunction or need lubrication. Just simple, cleanly designed parts, arranged in a rugged, foolproof manner for trouble-free operation. The economy and dependability of KPF switches has been proved on major utility systems for almost 50 years.



install in the air — or on the ground

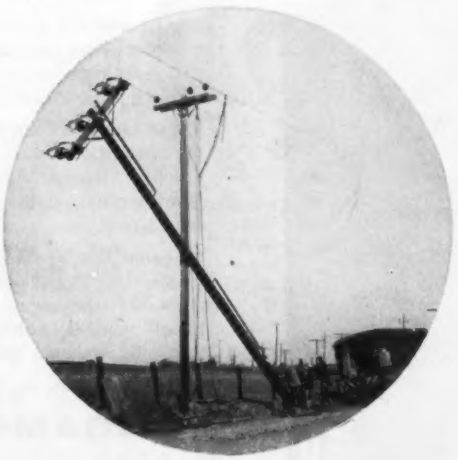


Mount phase units individually to pre-installed cross arm on the pole top.



Assemble complete switch on the cross arm before arm is installed on pole.

Mount switch and cross arm on pole, then tilt pole into position.



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AIR BREAK SWITCHES
Standard for nearly half a century

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ADVANCE Fluorescent Lamp Ballasts are "Silent Partners" to America's leading lighting equipment manufacturers. These fine ADVANCE Certified CBM Ballasts are designed by ADVANCE engineers to provide exacting amounts of electrical energy necessary to operate fluorescent lamps efficiently, economically and for long life. In providing this peak performance, ADVANCE becomes a real partner in bringing greater quality and value to users of fluorescent lighting.

ADVANCE ballasts are produced by skilled craftsmen using modern techniques in America's largest exclusive ballast manufacturing plant. Whether you use fluorescent lamp ballasts in products of your own manufacture, specify ballasts, or use ballasts in the maintenance of fluorescent lighting, a trial will prove that ADVANCE Certified CBM Ballasts give you more efficiency, longer life and greater value.

Let the ADVANCE service-stocking distributors be your partner in your ballast needs. Write for complete details and name of distributor nearest you.

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World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

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Widespread Acceptance of Hotpoint Automatic Clothes Dryers

Increases Utility Revenue!

Hotpoint

SUPER DE LUXE SEALED-CHAMBER DRYER

No venting required! (1) Purified, heated dry air (2) takes moisture and lint from clothes (3) cold water spray condenses moisture (4) lint and water are pumped down into the drain.

Hotpoint

AIR-BLOWER DRYER

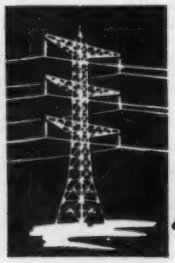
One connection for either 115 or 230-volt operation! Hotpoint quality, features and construction, in a low price automatic featuring Air-Blower drying. New Wide-Screen Lint Filter is convenient, efficient.

Promote the load that promotes profits! More Dryers on your lines mean greater revenue for you. Automatic Clothes Dryers use an average of over 750 Kilowatt hours annually—***and that usage is almost entirely concentrated in off-peak hours!*** With the demand for Dryers more than tripled in just five years, opportunities for increased utility revenue are better than ever.

Promote the dryers that promote acceptance! Hotpoint's leadership in engineering has accelerated consumer acceptance through ***exclusive*** automatic features and dependability of operation. The amazing Hotpoint Sealed Chamber Dryer requires ***no venting*** yet moisture, heat and lint cannot escape into the room. And famous Hotpoint quality and performance are also available in the low-cost Hotpoint Air-Blower Dryer that can be used on either 115 or 230-volt circuit!

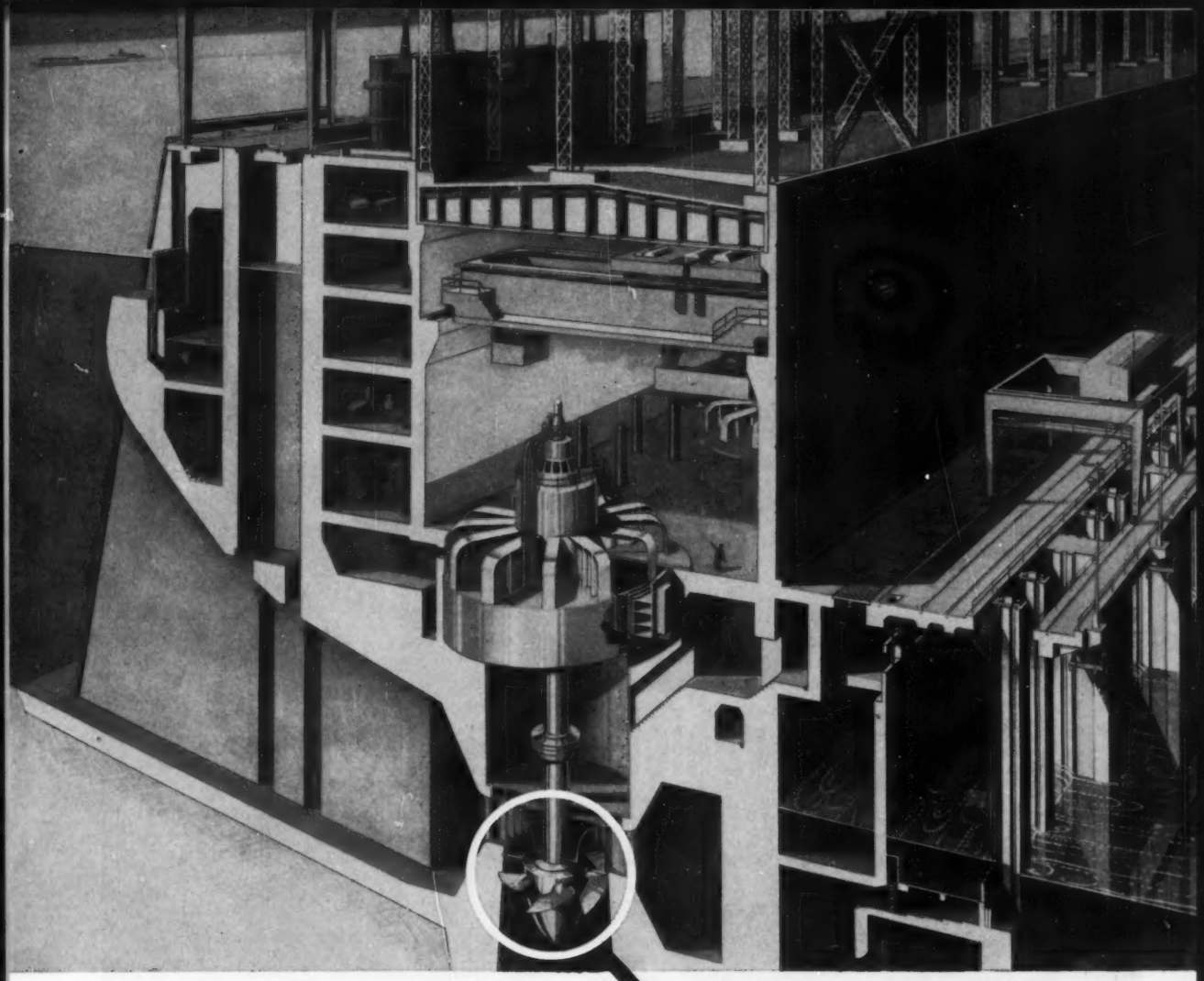
Promote the line that helps you promote! Hotpoint provides you with established acceptance in a wide-open market—and backs you up with an aggressive, hard-hitting merchandising program designed specifically for utility use. Get the complete story on how Hotpoint can help ***you*** increase ***your*** revenue. See your Hotpoint Distributor—***soon!***

Again, Hotpoint



looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**



Cut-away of The Dalles Dam power house. Artist's rendition courtesy of Portland District, Corps of Engineers, U.S. Army.

Runner of the Kaplan turbine is 280" in diameter.

The Dalles Dam gets biggest Kaplan turbines

Deliveries have now begun on an order covering 14 BLH Kaplan type turbines for The Dalles Dam on the Columbia River.

These are the most powerful adjustable blade propeller type turbines ever built. Each is rated to deliver 123,800 hp at 85.7 rpm under 81 foot head. The power plant will eventually house 22 turbines with total rated capacity of 2,723,600 hp. BLH is also furnishing the station service units and governors.

BLH is the recognized leader in hydraulic turbine research, design and manufacture. For a copy of our illustrated bulletin 1001, write to BLH Corporation, Philadelphia 42, Pennsylvania, or Dept. 5407 Pelton Division (BLH), 2929 Nineteenth Street, San Francisco 10, California.

B-2355

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DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Lima • Loewy-Hydropress • Pelton • Madsen • Standard Steel Works

Trenching. This 'Jeep'*-propelled trencher unit digs up to 800 feet of clean-cut trench per hour, to speed the installation of cable, conduit and service lines. With the accelerating trend to underground lines, the 'Jeep'-trencher unit becomes increasingly important in electrical industry service.

Versatile 'Jeep' vehicles do more jobs... GO "anywhere—any time"!

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Versatile "go-anywhere" 'Jeep' vehicles help assure uninterrupted, 'round-the-clock electrical service.

They have the all-wheel traction to go almost anywhere, to serve on job after job 24 hours a day. These rugged vehicles reach out-of-the-way line installations or patrol the right-of-way, in good weather or bad—wherever line service or maintenance is needed.

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Rugged 'Jeep' vehicles are functionally designed to withstand the toughest use...spread their cost over hundreds of different jobs from stringing high lines to installing meters. And their low upkeep, long life and high resale value provide extra savings. See your Willys dealer for an on-the-job demonstration today.

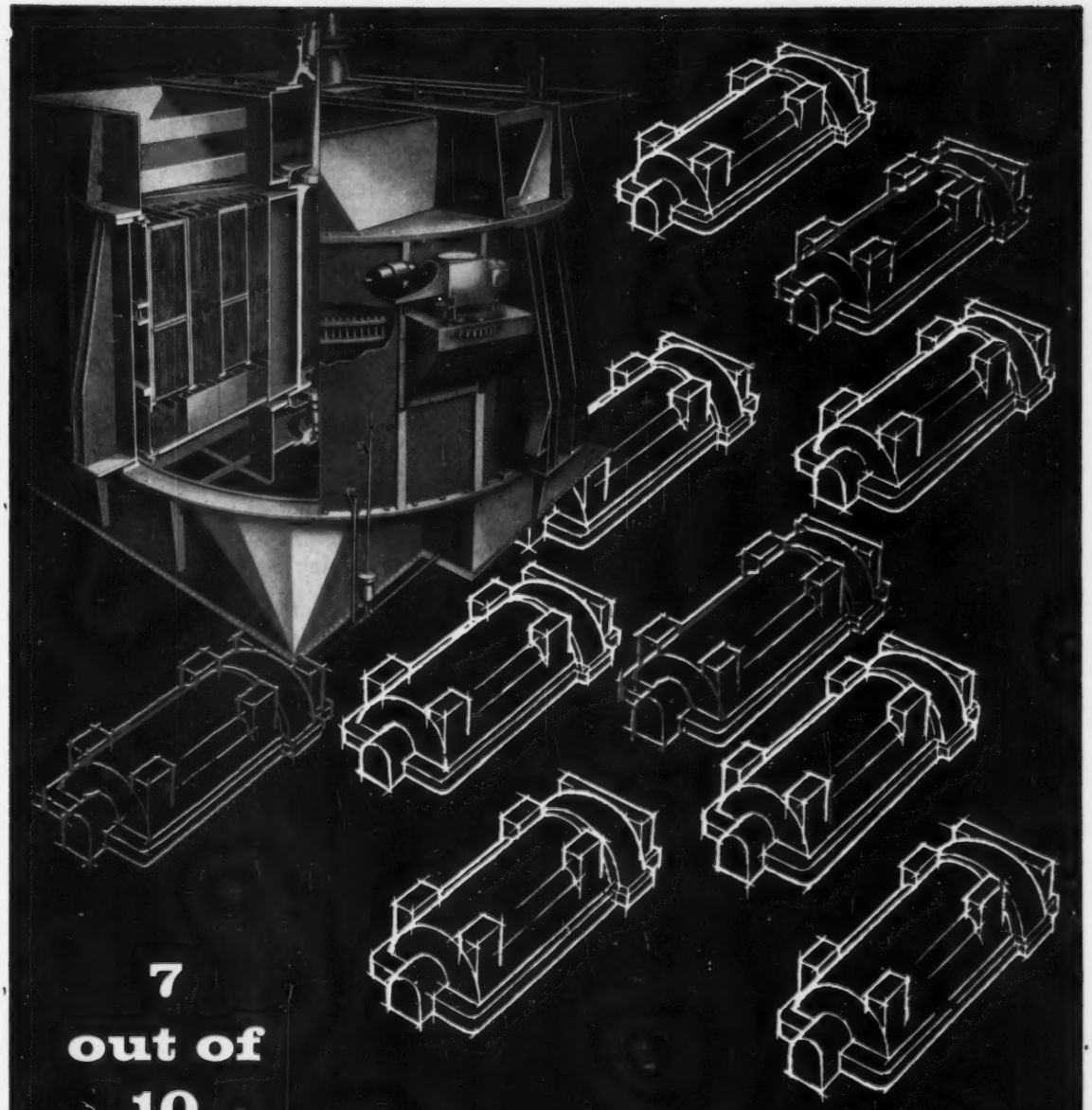
The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS...makers of the world's most useful vehicles

*Model CJ-5 shown

WILLYS MOTORS, INC., TOLEDO 1, OHIO



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MINIMUM MAINTENANCE is one of the many important reasons. More complete combustion of fuel results in far less slagging, and gases entering dust-recovery units are cleaner. There's less corrosion. Insertion of new elements can be done in as short a time as four hours. You can even inspect the Ljungstrom through a built-in port while the unit is in operation.

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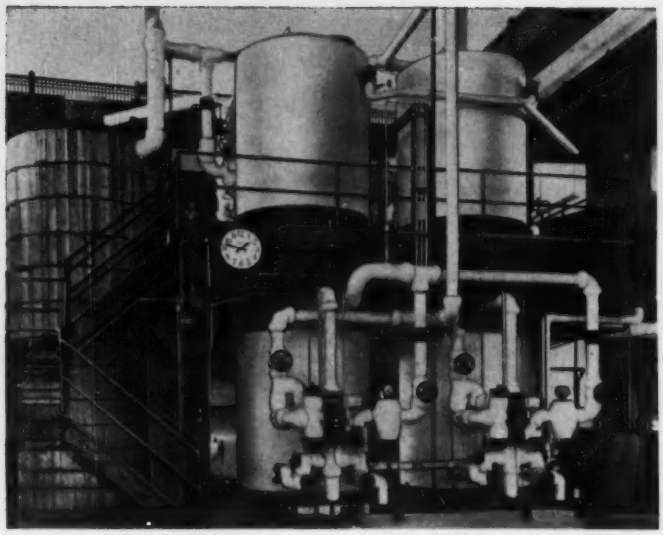
Your boiler feedwater problem is different!



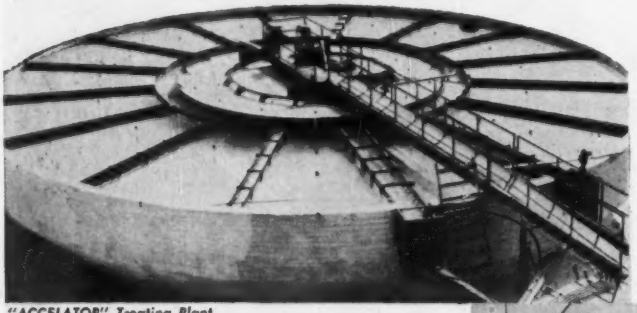
"CATEXER" "ANEXER" Demineralization Plant

That is why INFILCO offers you a complete range of water treating plants custom engineered to meet your particular requirements. For example–

If you use high pressure boilers, you might require a CATEXER® ANEXER® Demineralization Plant. These plants give you improved make-up quality, adequate supply regardless of station electrical load, reduced overall operating costs, and lowered maintenance costs and labor expense.

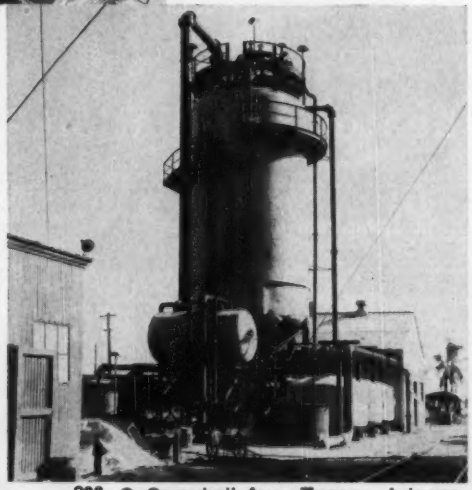
For low pressure boilers, the ACCELATOR® Treating Plant offers a most economical means of treating feedwater. It is also frequently recommended for pre-treating make-up water for high pressure boilers. "ACCELATOR" Clarifiers and Softeners have a proven record of flexibility and ease of operation.

Feedwater for intermediate boiler pressures can often be treated by INFILCO Hot Process Softeners. These softeners are noted for their accurate treatment control and superior performance. They are often used in combination with Hot Process Zeolite Softeners.



"ACCELATOR" Treating Plant

Whatever your feedwater problem, you can depend on the complete engineering know-how and many years experience that have made INFILCO a leader in this field. Why not submit your problem today. INFILCO engineers will suggest a practical solution. Write for information.



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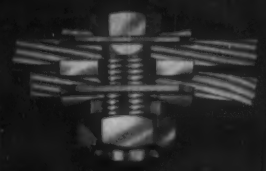
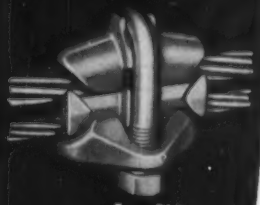
Field offices throughout the United States and in foreign countries. 5327



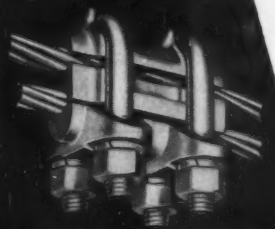
Type AAW

Type PAA

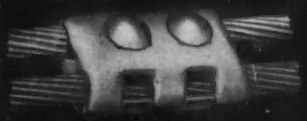


Type DLC

Type W



Type 2U AA



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Always Use Blackburn Aluminum Fittings When Terminating or Joining Aluminum Conductors

- Each clamp accommodates a wide range of conductors.
- Castings are high-strength, corrosive-resistant, heat treated aluminum alloy.
- Blackburn special surface treatment eliminates production oxides and improves conductivity.
- Bell contoured grooves protect conductors. Clamping forces are distributed over extra-large contact area.
- Available with galvanized steel or aluminum hardware. Aluminum hardware is alumilited to prevent seizing.
- Can be quickly and easily installed with regular linemen's equipment. No special tools required.

IMPORTANT: We recommend the use of CONTAX on all aluminum connections. CONTAX is an oxide inhibiting compound with an ASTM drop point of 549° F.

BLACKBURN *Aluminum* FITTINGS

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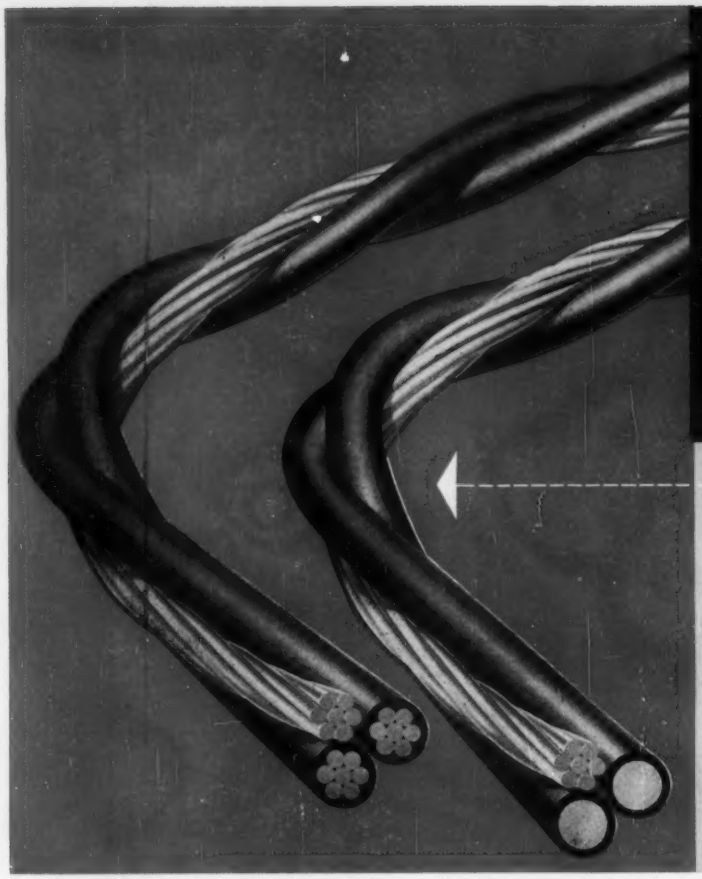
35 Madison St., St. Louis 6, Mo.
Phone MAin 1-2821



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triplex

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quadruplex

NEOPRENE or POLYETHYLENE
Self Supporting Service Cable

Southwire...a name synonymous with service...offers a complete range of self supporting service drops to meet every possible need.

AAC...ACSR...or Copper. In every combination to customer specifications. All are manufactured, from start to finish, in our own modern plant.

Southwire Neoprene or Polyethylene is especially designed for low-voltage installations. Every service drop meets or exceeds ASTM specification.

Whatever your requirements, specify Southwire and get the fastest, most reliable delivery possible—by our own fast fleet of trucks.

SOUTHWIRE PRODUCTS

- Bare and Weatherproof Copper and Aluminum Line Wire
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- Polyethylene Weatherproof Copper, Aluminum and Triplex
- Southwire Vinyl Weatherproof Copper, Aluminum and Triplex
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Southwire Company

TErrace 2-6311 CARROLLTON, GEORGIA

"SOUTHWIRE MEANS SERVICE"

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM POWERS-AMERICAN DERRICK EQUIPMENT

MOST ADVANCED HYDRAULIC DERRICK EVER BUILT

POWERS American

PROUDLY PRESENTS

the Sensational

New Pole-Master® PM-2

HYDRAULIC DERRICK

The new PM-2 offers *more* outstanding operating characteristics than *any* derrick ever made. It utilizes the most desirable features of the famous *HD-2* and *HD-4* Pole-Master Derricks . . . has a unique new design that's destined to set a new standard for fully-powered derricks. You'll like everything about the new PM-2 . . . especially the time and money it saves. Three sizes: for 40′ poles, for 55′ poles, and for 75′ poles.

LOOK AT THESE OUTSTANDING FEATURES:

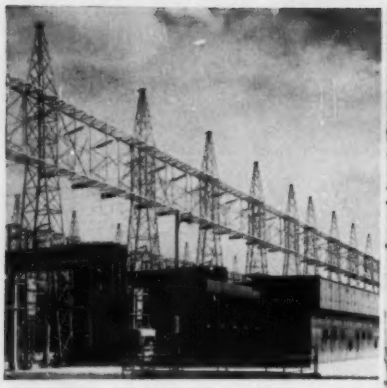
Completely fool-proof operation • "Live" boom can be moved under load • Operating arc *well in excess* of 180 degrees • Requires only single-drum winch • Head sheave can be threaded from ground • No center leg or exposed mechanism • Does not obstruct cargo area or rear of body • Operated by one double-acting control valve • Permits complete closing of body roof.

McCABE-POWERS

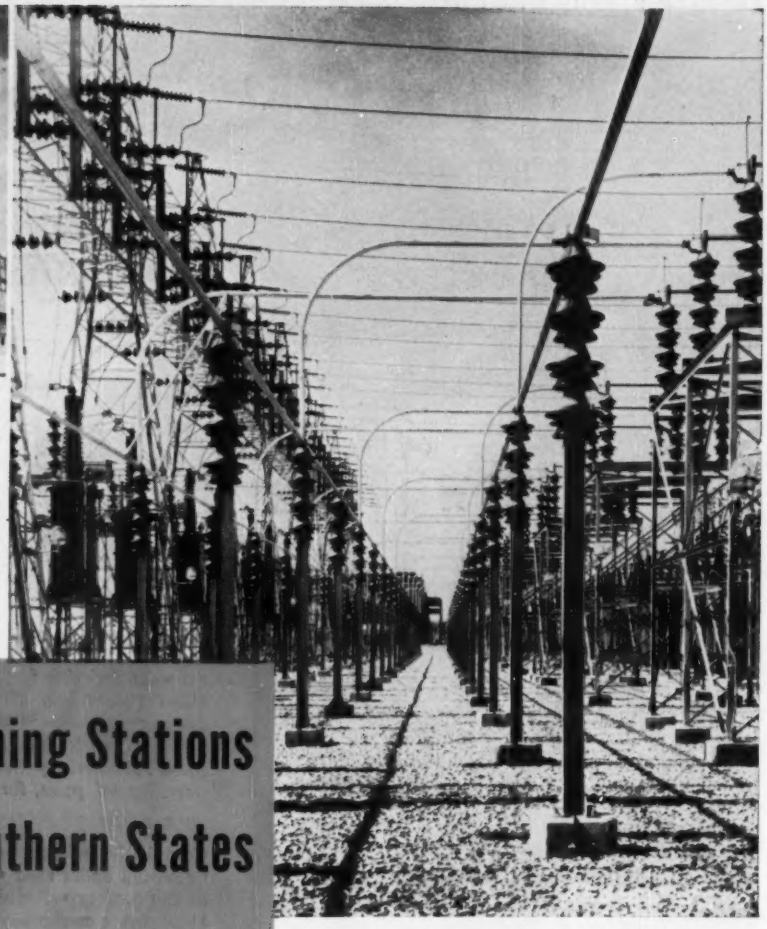
AUTO BODY COMPANY

5900 NO. BROADWAY, ST. LOUIS, MO. 625 CEDAR ST., BERKELEY 10, CALIF.

Bulletins describing Pole-Master Derricks —Series PM-2, Series HD-2, and Series HD-4—will be sent, with price information, upon request. No obligation, of course!



PADUCAH, KY.—AEC plant's 25-acre switchyard where two stations supplied by Southern States use a total of 128 Type WAG Air Break Switches.



Paducah Switching Stations Supplied by Southern States

THE ATOMIC ENERGY COMMISSION'S plant at Paducah, Kentucky, has about 25 acres of electrical switchyards. Power fed through the yards is about 17 billion kwh annually. The structures and much equipment for two switchyards in this AEC development were supplied by Southern States—C-31 with 500,000 kva capacity, and C-33 with 1,000,000 kva capacity. Nearly a million pounds of steel were required for the two structures which occupy over one-quarter of a million square feet.

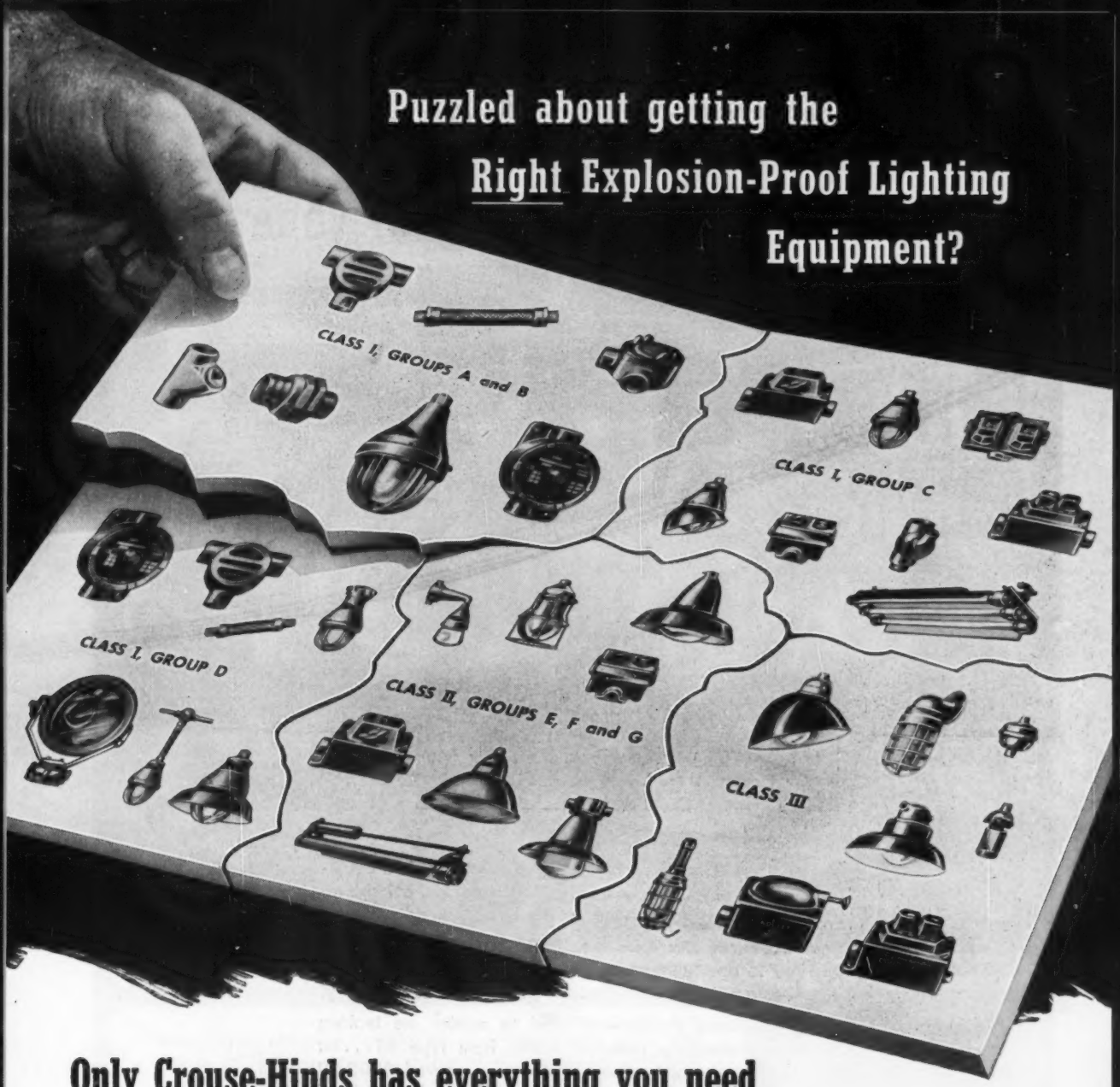
Among the Southern States equipment supplied with the structures were 128 Type WAG Air Break Switches. Of them, 121 were rated 161 kv-1200 amperes; four were rated 161 kv-600 amperes; and three 15 kv-2000 amperes.

This is another example where Southern States equipment was used for one of the nation's largest installations—a fact worth remembering when ordering or specifying equipment that demands dependability and performance.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

Puzzled about getting the Right Explosion-Proof Lighting Equipment?



Only Crouse-Hinds has everything you need

...in every class ...in every group!

For *complete* protection when making lighting installations in hazardous locations you need more than explosion-proof or dust-tight lighting fixtures. You also need UL-listed explosion-proof switches, junctions, fixture supports, unions and seals.

Crouse-Hinds now offers a broad selection of Condulet* explosion-proof lighting equipment for Class I, Groups A and B locations. In fact, you can specify complete Crouse-Hinds explosion-proof lighting installations, all UL-listed, *no matter what class or group of Article 500 of the National Electrical Code is involved.*

The same holds true for the entire Crouse-Hinds Condulet line of more than 15,000 conventional and explosion-proof items. With the broadest line in the field, Crouse-Hinds recommends *exactly* what you need . . . and *only* what you need.

A nearby Crouse-Hinds distributor will be glad to discuss your explosion-proofing problems and make recommendations without obligation.

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

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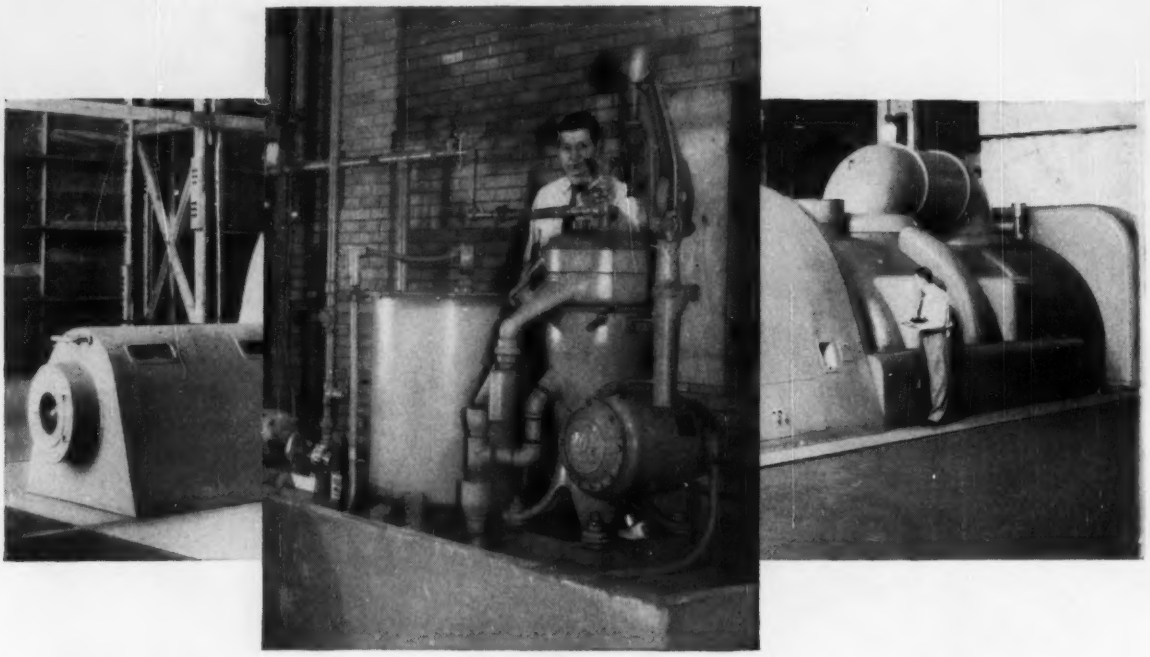
DE LAVAL TURBINE LUBE PURIFIER SAVES $800 A DAY!



Recently, a turbine in the City of Detroit's power plant developed a water leak . . . so serious that under normal circumstances it would have meant a costly turbine shut-down.

But . . . because of a De Laval Turbine Oil Purifier installed in 1949 to operate with an oil reservoir serving all the turbines, or any individual unit . . . no shut-down was necessary!

The De Laval Purifier—switched to service the leaking turbine—continuously removed water from lube oil . . . let the turbine operate without shut-down . . . *saved $800.00 a day* it would have cost to cut in an old stand-by turbine!

At $800.00 saved per day, the De Laval Purifier paid for itself in less than six days. Even more important, it gave positive proof of the efficiency and economy of De Laval Purifiers in any situation—emergency or otherwise!

Get all the facts . . . that mean protection for your plant and equipment!

DE LAVAL
SEPARATOR COMPANY

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

Each of these Penta-treated poles is ready to serve 30 years or longer

Checking new shipment of Penta-treated poles destined for Ohio Edison Company lines, one of many utilities using such poles.

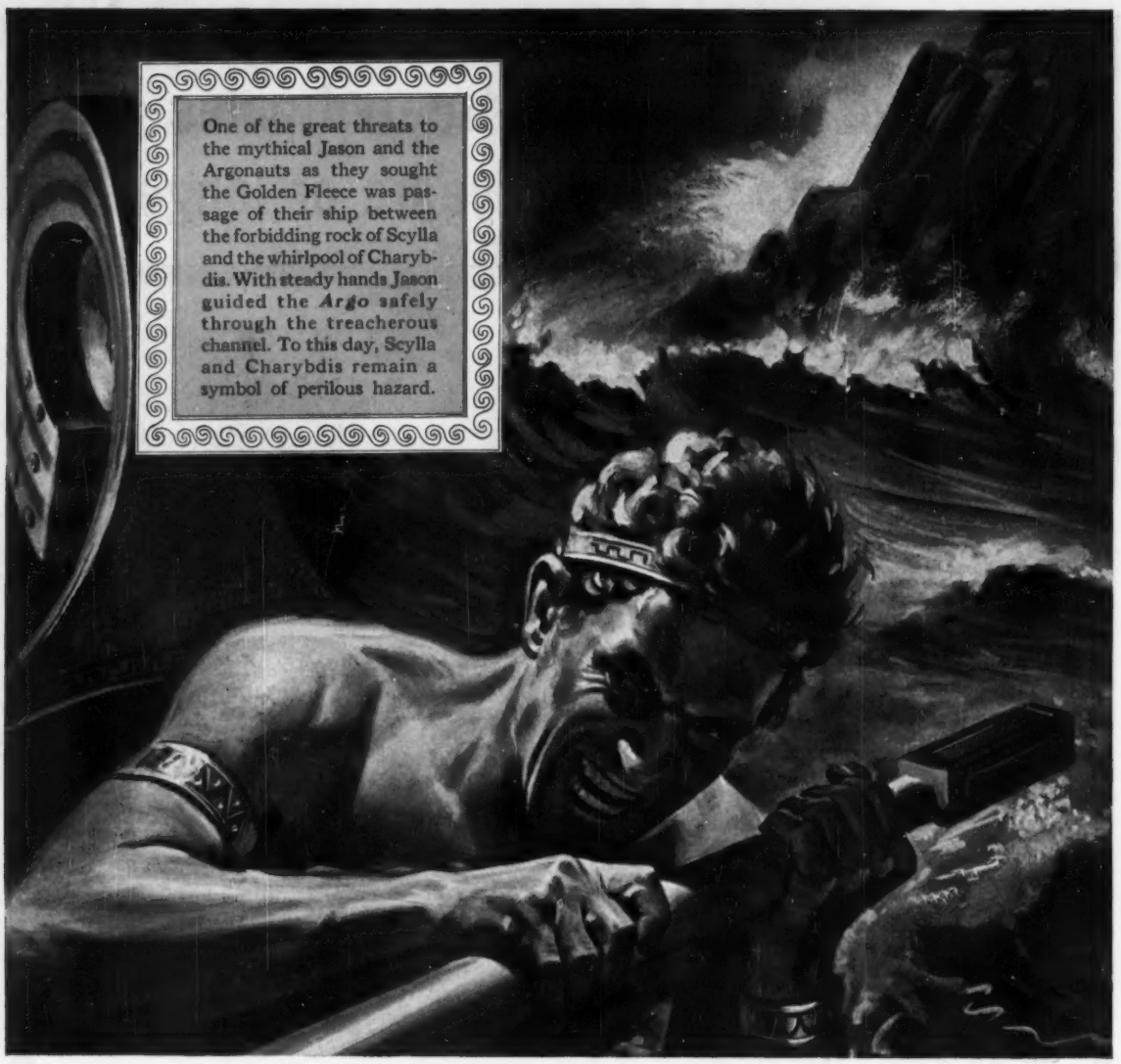
Today, more and more utilities specify Penta-treated poles. The reasons for this are clear. Poles treated with Penta are protected from decay and insect attack for 30 years or longer. And they stay clean . . . will not "burn" hands or stain clothing. The public appreciates this feature and so do linemen. Handling is easier, installation faster.

Penta protection can be measured. Penta is not a by-product. It is a uniform chemical compound, developed by Monsanto especially for wood preservation. Because of this uniformity, you can take increment borings from Penta-treated poles, have them chemically analyzed and determine the *exact* amount of Penta in the poles.

SPECIFY PENTA for wood poles, crossarms, transformer platforms, braces, control boxes, planking. Treating plants all over the country are ready to apply Penta for you. Write us for this list and for free "Poles and Crossarms" booklet. Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. PI-2, St. Louis 1, Mo.

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU


One of the great threats to the mythical Jason and the Argonauts as they sought the Golden Fleece was passage of their ship between the forbidding rock of Scylla and the whirlpool of Charybdis. With steady hands Jason guided the *Argo* safely through the treacherous channel. To this day, Scylla and Charybdis remain a symbol of perilous hazard.

WHEN ENDURANCE COUNTS

Overcoming the perils of Scylla and Charybdis, Jason and the Argonauts demonstrated great endurance in the face of severe destructive elements. Another—and more modern—demonstration of great endurance is Kerite Cable. Under every manner of adverse condition, throughout the world, Kerite Cable stands steadfast against all the elements which would destroy its efficiency. Kerite Cables, in perfect operating condition after 40 or more years, in hazardous original installations, is the rule, rather than the exception. The world over, the Kerite name is recognized as a symbol of *durability*.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

EDITORIALS

1970 Looks Better Than Ever

Electrical World's annual electrical industry forecast can go a long way toward easing the industry's biggest headache—planning.

Our forecast is no cure all or magic potion. But if it's used to put your planning in perspective, it can help avoid real trouble. The point is that the electrical industry is just that—an industry. When your neighbor decides he needs a new generator, he puts himself on a waiting list. If you are going to need capacity sooner than you thought, his order may delay shipment of your equipment. If neither of you has planned far enough ahead, you are both going to have to pay for a share of a manufacturer's expansion and the overtime pay you've forced on him by jamming his schedule.

Manufacturers have used Electrical World's forecasts for years to double check their own planning. And utilities show increasing interest in these "look aheads." We know of one case where a utility ordered a new generator in days instead of "months from now" as planned because our forecast made officials realize that margins were at a point that would send everyone scurrying for new capacity. You can visualize many other important applications of this forecast to your planning problems.

This is Electrical World's seventh electrical industry forecast—the third looking ahead to 1970. Each in turn has predicted a bigger, better, brighter tomorrow. There are a number of reasons for this mounting optimism. First is that we have always been conservative in our outlook for the immediate future. And now our staff of economists foresee a much rosier future.

The insatiable consumer appetite for goods and services coupled with the industry's willingness to expand are responsible. Electrical World's predictions are based on the belief that Americans will continue to strive for and achieve an improved standard of living—a standard that is becoming synonomous with electrical living. To meet the demands of a constantly rising living standard for a growing population, industry, agriculture, and commerce must continue to grow.

Dynamic growth of the American economy during the past decade has brought a spectacular rise in the use of electrical equipment and energy. In the years ahead we look for a continuation of this growth.

We hope that the data in this forecast will help the electrical industry prepare for its place in our future economy.

Job Evaluation Works

If the experience of other industries can be relied upon as a guide, utility management today will find modern job evaluation methods effective in many problem areas. Many are already finding the technique an effective tool in solving, or at least adjusting, problems arising from wage inequities.

This is a basic conclusion of Prof Elizabeth Lanham, University of Texas, who presents in this issue an analysis of a recent survey of utility experience with job evaluation. In commenting on her survey findings Professor Lanham continues:

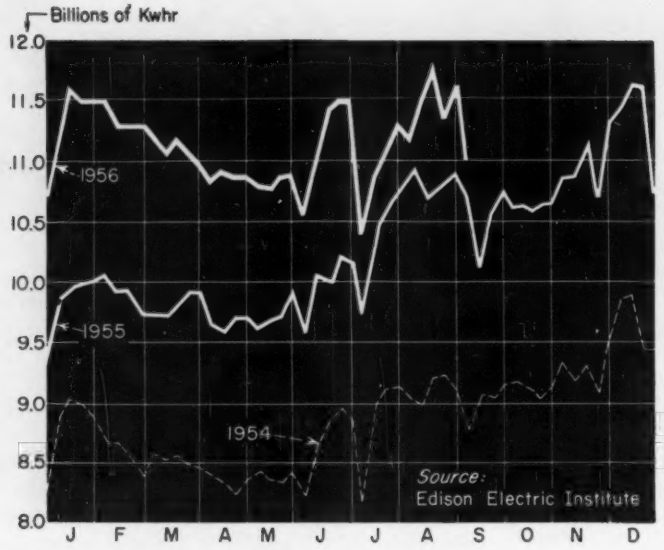
"Utility companies now using job evaluation programs don't claim they have resolved all the problems inherent in their salary and wage structures. They recognize that job evaluation is not a panacea for every problem in this field. The techniques involve a high degree of human judgment which permits certain inequities to creep in.

"But the consensus among utilities covered by the survey is that job evaluation provides an orderly and systematic way to determine the relative worth of jobs. They feel that greater familiarity with the application of its techniques to solving their particular problems will enable them to reduce errors they are currently experiencing in its use.

"Based on data gathered from this group of companies, it is apparent that job evaluation can prove worthwhile in the utility field and that its use can be effective in resolving many utility-management problems.

ELECTRICAL WEEK

LAST MINUTE



OUTPUT

Week ended Sept. 8
10,955,000,000 Kwhr
Up 7.9%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 7.0%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 8	+7.9	+10.7	+9.4	+9.6	+9.7	+5.0	+13.0	+8.8	+4.0	+2.3
Sept. 1	+8.0	+10.8	+8.6	+10.1	+11.0	+5.4	+10.6	+11.3	+3.7	+3.2
Aug. 25	+4.0	+11.1	+3.7	+3.0	+2.0	+3.0	+2.2	+11.7	+2.8	+8.0

Seasonally Adjusted Index 207.7 Week Ago 218.3 Year Ago 201.9

Here are the issue's highlights . . . Despite weather, 1956 summer peaks climb 9.2%, representing an 8.5-million-kw gain over last summer's . . . Edgar Dixon says formation of EEI's Technical Appraisal Task Force for atomic power development is one of the boldest and most effective moves the electric industry has undertaken to head off a federal atomic power program . . . Utility presidents, meanwhile, will meet Sept. 19 to chart the industry's future atomic power course . . . Shippingport's 'hot' wastes will be safe . . . Soviets designing "solar" power station for industrial use . . .

Ohio Edison has put its new electronic differential analyzer to work. It figures up which power plant throttle to pull when—then pulls it . . . 132-kv submarine cable connects Vancouver Island and mainland . . . Is higher debt ratio for utility financing coming?

Final arrangements have been made for linking private and public electric systems of Colorado, Wyoming, and western Nebraska with the Pacific Northwest power pool. The three-state pool of approximately one-million kw will begin to flow Oct. 15 into the 7.5-million-kw Northwest power pool.

"The public isn't being informed," Ed Vennard, EEI managing director, told annual meeting of Northwest Electric Light & Power Association. Industry should present specific issues to public. He suggested constitutionality of federal power projects, federal financing at no or low interest, inadequacy of payments in lieu of taxes, and preference clauses.

Bold regional nuclear development program proposed to southern governors. Recommendations include more intensive science training at high school and college levels, nuclear testing stations at strategic sites, expanded agricultural research, and nuclear exhibit to inform public and win public support for the proposals.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Federal Power Commission allows Pacific Gas & Electric to present evidence for reopening rate increase case. U. S. Supreme Court previously rejected the FPC ruling allowing PG&E to increase rates to Sierra Pacific Power Co of Reno by $419,000 a year . . . FPC reports preliminary July figures on electric operating revenues of larger privately owned utilities are up 8.9% from $590.6 million in 1955 to $642.9 million this year . . . Interior Department has placed initial construction camp contract for Trinity River Dam near Lewiston, Calif., with prime contract to be awarded in January . . . "Critical Manpower Situation for Public Utilities" was discussed at Maryland Utilities Association fall conference.

Pacific Power & Light and Cowlitz County (Wash.) PUD file joint application with Federal Power Commission for licenses to develop Swift hydro site on Washington's Lewis River. PP&L would build the $44-million, 63,000-kw Swift No. 1; PUD would build the $12-million, 33,750-kw Swift No. 2. The utility would buy Swift No. 2's power until the PUD needed the capacity.

General Electric sets code for appliance servicing. Requirements for its dealers and distributors repairing major appliances include reasonably fast service from trained men and minimum parts inventory.

Entire flow of Columbia River at McNary Dam is being diverted through powerhouse turbines for first time since last winter. The 123,000-cfs flow is sufficient only to turn the 12 units at minimum generator load. River flow is insufficient during weekdays, and some water must be drawn from the reservoir. Then it is brought to normal pool level on weekends.

Private utilities must be hitting the bull's eye in their efforts to explain Tennessee Valley Authority to the public. For Joe Marshall, executive director of Citizens for TVA, declares: "Anti-TVA advertising is poisoning the minds of the people against the TVA, and it is one of the most ominous developments of our time." He insists there is a "loophole in our laws which permits the private power industry . . . to make outrageous claims, misrepresent the truth, and tell out-and-out lies with impunity."

ABOUT PEOPLE IN THE INDUSTRY

Criticism of the nuclear power plant being built by Power Reactor Development Co is part of a "subterfuge" campaign aimed at squeezing private industry out of the nuclear power field, declares **Walker L. Cisler,** president of PRDC and Detroit Edison. If PRDC's plant is sidetracked in favor of government atomic power, it will mean "we are headed down the road to a socialist state, even unwittingly," Cisler says.

American & Foreign Power has its own program for assuring U. S. leadership in the nuclear power field. It has placed orders for two atomic plants and is negotiating for a third for its Latin American properties. **Pres Henry Sargent** says these plants probably won't be as economical as conventional plants, "but we hope to gain experience and know-how to put us in a position of technical leadership in the future."

More News About People page 282

Summer Peaks Above Last Year, But Slightly Below Estimates

Company	1956 Summer Peak Load kw	Increase Over 1955 Summer Peak kw	Increase Over 1955 Summer Peak %	Increase Over Estimated 1956 Summer Peak %	Increase 1956 Summer Peak Over 1955–56 Winter Peak %
Alabama Power Co	1,349,600	89,600	+ 7.1	−6.2	+11.7*
American Gas & Electric System	3,494,000	312,000	+ 9.8	−1.5	.....
Atlantic City Electric Co	264,700	30,400	+13.0	+2.2	+11.8*
Baltimore Gas & Electric Co	805,000	66,000	+ 8.9	+1.1	+ 4.4
Boston Edison Co	683,740	−3,760	− 9.5	−5.0	−17.2
Brockton Edison Co	56,200	1,000	+ 1.8	−3.1	−24.0
California Electric Power Co	205,500	9,200	+ 4.7	−5.3	+14.2*
Carolina Power & Light Co	880,000	71,000	+ 8.8	−0.79	+ 0.23
Central Maine Power Co	331,000	28,680	+ 9.5	+1.6	− 5.29
Central Vermont Public Service	91,400	7,300	+ 8.6	+3.3	− 7.70
Cleveland Electric Illuminating	1,180,000	37,000	+ 3.2	−1.2	+ 3.5
Commonwealth Edison Co	3,555,000	196,000	+ 5.85	−2.1	− 2.87
Conn. Light & Power Co	563,000	34,000	+ 6.4	−2.0	−15.0
Consolidated Edison Co of N. Y.	3,203,000	249,000	+ 8.4	−2.2	− 0.4
Consumers Power Co	1,383,000	68,975	+ 5.25	.....	− 5.15
Dallas Power & Light Co	609,600	80,000	+15.1	−0.2	+81.2*
Delaware Power & Light Co	292,600	24,560	+ 9.2	−4.2	+ 3.5
Detroit Edison Co	2,156,000	94,000	+ 4.56	.....	−12.46
Duke Power Co	2,040,600	170,000	+ 9.00	−1.6	+ 5.5
Duquesne Light Co	1,052,000	87,000	+ 9.0	+4.4	− 2.2
EE Inc and OVEC	3,167,410	635,563	+25.1	.....	+ 2.6
Florida Power Corp	448,400	63,600	+16.5	−4.7	−11.3
Florida Power & Light Co	762,800	648,000	+17.7	+1.7	−18.4
General Public Utilities	1,543,100	123,100	+ 8.7	−1.89	− 6.5
Georgia Power Co	1,695,000	135,000	+ 8.6	.....	+ 9.8*
Hartford Elec Lt—Conn Pwr Co	265,100	1,400	+ 0.5	.....	−13.4
Kansas City Power & Light Co	610,000	33,000	+ 5.7	+0.8	+27.1*
Kansas Gas & Electric	401,700	67,000	+20.0	+6.8	+40.7*
Long Island Lighting Co	589,500	96,500	+19.6	−1.75	−16.5
Los Angeles Dept Water & Pwr	1,044,000	75,000	+ 7.7	−1.51	−12.1
Louisiana Power & Light Co	375,000	38,000	+11.0	−3.85	+32.0
Mississippi Power & Light Co	351,700	39,200	+12.5	−3.5	+36.0*
New England Electric System	1,097,000	23,000	+ 2.1	.....	−15.3
New Orleans Public Service Inc	313,000	28,500	+10.0	−0.3	+62.0*
New York State Elec & Gas Co	437,400	18,769	+ 4.5	.....	−12.6
Niagara Mohawk Power Corp	2,670,000	−25,300	− 0.8	.....	−17.7
Northern States Power Co	979,770	53,218	+ 5.7	−2.6	−10.8
Ohio Edison System	1,262,700	62,200	+ 5.18	−2.57	− 6.56
Oklahoma Gas & Electric	620,000	88,600	+16.67	−1.61	+51.77*
Pacific Gas & Electric	4,085,000	296,600	+ 7.83	+4.55	+14.40*
Pacific Power & Light Co	636,700	48,900	+ 8.32	−2.69	−16.93
Pennsylvania Power & Light Co	1,153,000	94,000	+ 8.2	−1.0	− 0.5
Philadelphia Electric Co	2,070,000	142,000	+ 7.4	−0.7	− 7.2
Potomac Electric Power Co	863,000	53,000	+ 6.5	+0.9	+26.9*
Public Service Co of N. H.	237,100	14,100	+ 6.3	−4.8	− 8.4
Public Service Electric & Gas	1,961,700	149,100	+ 8.2	−1.9	− 3.7
Puget Sound Power & Light Co	385,000	30,000	+ 8.45	−1.0	−20.0
Rochester Gas & Electric	275,000	6,500	+ 2.4	−3.9	−10.8
Seattle City Light Dept	573,000	38,000	+ 6.6	+0.5	−21.8
South Carolina Electric & Gas	411,000	39,000	+10.5	+1.0	+ 9.0
Southern California Edison Co	2,326,600	120,800	+ 5.5	.....	+ 1.8
Southwestern Gas & Electric	400,700	69,600	+21.0	+3.9	+57.2*
Tacoma City Light Dept	309,000	12,000	+ 4.4	+2.7	+15.8
Tennessee Valley Authority	7,612,000	564,000	+ 8.0	+0.2	− 8.3
Union Electric Co of Missouri	1,480,000	85,000	+ 6.1	+3.0	+15.0*
United Illuminating Co	297,550	35,450	+12.8	+0.2	− 6.3
Utah Power & Light Co	504,400	43,000	+ 9.5	.....	− 8.7
Virginia Electric & Power Co	1,172,000	110,000	+10.3	−2.3	+ 2.0
Washington Water Power Co	453,000	53,000	+13.25	+4.6	−15.6
West Penn Electric System	1,383,000	115,000	+ 9.1	−1.9	− 4.2
Totals	**71,414,770**	**6,003,815**	**+ 9.2**	**−0.48**	.....

* Designates systems with annual peak in summer

'56 Summer

Despite the retarding effects of cooler-than-normal peak periods, the utility industry's summer peak loads, through Labor Day, approached expected levels to score a husky 9.2% increase over last summer's peak.

According to a survey by Electrical World, Class I utilities showed an increase in summer peak load this year of 8,401,348 kw over last summer's peak of 91,319,000 kw for a total of 99,720,348 kw. This compares with the Edison Electric Institute April estimate of 101,290,000 kw and tops last winter's peak of 98,120,000 kw for Class I companies. To date 1956 winter peaks for Class I companies are expected to total 105,841,000 kw.

The survey upon which these summer peak data are based covered 90 Class I utilities—including those supplying energy to AEC. This group of utilities reported peaks aggregating 71,414,770 kw for an increase of 6,003,815 kw or 9.2% over summer peaks of 1955. While some 45 companies surveyed expected higher summer peaks than were experienced, the actual total peak was only 0.48% lower than was estimated by individual reporting companies.

There Was Margin to Spare

Available to handle the summer peak loads was a generating capability of 119,600,000 kw as of the end of June for Class I companies. Industry generating capacity at the end of this year is expected to be 126,000,000 kw.

The fact that temperatures have not been excessively high or long sustained at summer maximums has held down the contributions of air conditioning and kept peak loads this summer from rocketing upward as they have during the heat storm periods of the past two years. Moreover the steel strike, although it came during the summer peak period, was cited by only a few companies as a restraining influence on loads. Duquesne Light Co, however, reported July peak off 25% due to it. Otherwise industrial activity on the whole was generally normal, contributing little to either boost or buck peak load increases. Thus with the weather too largely canceled out as a factor, load growth remained as the major cause of 1956 summer peaks.

Peak Climbs 9.2% Despite Weather

The month of August, however, continued to be the one in which summer peaks most frequently occurred. Fully half the 90 reporting companies reported August peaks. The majority of these fell during the last half of the month. There were exceptions of course, notably in the Northeast, where a mid-June hot spell set several early peaks in the absence of the one or two sustained heat waves typical of August. New England Electric System reported that summer dark-day load continues to be 15,000 to 20,000 kw higher than hot-day load and is expected to continue so for several years. Rochester Gas & Electric too scored its summer peak on a day (Aug. 30) when the average temperature was 68.2 F.

More Annual Peaks in Summer

Fourteen of the 90 companies surveyed normally have annual peaks during summer months. The list is growing. By 1957 Con Edison of New York expects equal summer and winter peaks. In subsequent years the annual peak should occur in the summer, it was said.

In the plains states of the midwest, where the annual peak is normally in summer, cooler weather cut into air conditioning loads somewhat. Union Electric Co estimated that about 190 Mw of its July 27, 1,480-Mw peak was air conditioning. Kansas Gas & Electric reported that during cool days this summer when air conditioning was not in use, peak fell anywhere from 50 to 80 Mw.

To the North, Detroit Edison reported only 6 days of over 90 F temperature this summer. Normal summer load was also affected by the steel strike which occurred during July and continued in August for one large steel producer in the area.

Commonwealth Edison reported a June peak. There were 10 days that month when temperature was 90 F or over and one such period of five consecutive days. The June 13 peak came on the fourth day of this period. August was cool. Even though industrial activity was at June levels, the lack of consecutive days of hot weather above 90 F held load to June levels. Since settlement of the steel strike, industrial activity has built up in Chicago area to about pre-strike level particularly large industrial.

In the deep South, both Florida Power Corp and Florida Power and Light—with annual peaks normally in winter months—reported summer load growing faster than winter. But due to the winter tourist season they expect it may be some years before air conditioning, summer tourism, and year round industry will bring a summer peak.

Mississippi Power and Light experienced a lower summer peak than expected due to absence of an extended period of high temperature. But the possibility of a hot September and seasonal cotton ginning load is expected to bring a September peak this year. A similar prospect exists in Alabama Power Co territory where peaks to September 3 were 6.18% below estimates due to absence of excessive and sustained summer maximum temperatures and a work stoppage extending from April 29 to August 3 in a large local steel mill.

In Louisiana, Southwestern Gas & Electric reported a normal summer except for the first two weeks of August which were abnormally hot and built a peak of 3.9% higher than estimated.

In the Pacific Northwest both the Washington Water Power Co and Tacoma City Light reported that summer peaks were due to somewhat cooler than usual weather, with air conditioning load relatively light.

Pacific Gas & Electric reported summer peak load smaller than anticipated due to lower summer temperatures, reduced irrigation pumping, and the steel strike.

Southern California Edison Co experienced a mild summer with daily peaks running below estimates until a hot spell on Aug. 22, 23 and 24. Then load climbed slightly above August estimates. Most of the increase was attributed to air conditioning load.

Los Angeles Department of Water and Power reported that peak loads in 1956 and 1955 occurred on similar warm summer days. The increase in 1956 load over the 1955 load was caused chiefly by normal load growth. A comparison of the summer peak load, which occurred during abnormal hot weather, with other prior and subsequent peaks during cooler weather indicate hot weather caused an approximate 7% increase in peak load.

BG&E Installs 750-Mva Switchgear

Officials of Baltimore Gas & Electric Co and General Electric Co inspect the new 750-Mva metal-clad switchgear with magnetic type power circuit breaker recently installed at the utility's new Center substation. The breaker has 50% higher interrupting capacity than any previous breaker of its type.

"There are those who argue that a more aggressive, perhaps a more enlightened, utility industry 25 years ago . . ."

EDGAR H. DIXON

Atom Power Fight Lurks Ahead

One of the boldest and most effective moves that the electric industry has ever made, in the opinion of Edgar H. Dixon, is the current formation of a Technical Appraisal Task Force on Nuclear Power. With luck, this task force may play a big role in helping to keep government out of the atomic power business.

The 51-year-old president of Middle South Utilities, Inc, in addressing utility executives attending a management course at Georgia Institute of Technology, said that the industry's atomic power program is one of the most important situations the industry now faces—particularly as it relates to the possible advance of public power in the U. S.

"As background for this discussion," he said, "let's look back a quarter of a century. . . . There was no TVA. There was no REA. There was no Bonneville Administration. There was no Southeast or Southwest Power Administration. Nebraska was not a public-power state."

He continued:

"There are those who argue that a more aggressive, perhaps a more enlightened, utility industry 25 years ago might have prevented or minimized these costly social experiments. Perhaps if the electric industry had been able and willing to do the rural job, we might not be worrying today about REA encroachment into some of the towns we serve. . . ."

But such was not the case and the only consolation is the hope that territorial and other physical limitations might tend to confine such activities.

Federal Reactors Pledged

"But let's look at atomic power reactor development," he said. "As proposed at the last session of Congress by the original Gore Bill, the Atomic Energy Commission would have been directed to undertake a 'crash' program of reactor development. We might well have seen a rash of nuclear power plants built all over the country. . . . There was to be no need of economic justification—in fact the argument was made that government should build them because they were uneconomic. The power produced would have been subject to the preference clause. . . . True, a modified Gore Bill was defeated, but the new Democratic Party Platform pledges the party 'to accelerate the domestic civilian atomic power program by the construction of a variety of demonstration prototype reactors.'

"It is my belief that our industry is responding to this current threat in a most enlightened manner. Obviously it is much too early to predict the outcome—but the vision and courage displayed by many in our industry to date gives me great hope that others in the electric power field also will rise to the occasion."

Tracing the industry's action, Dixon pointed out that the Edison Electric Institute created in 1953 a Committee on Atomic Power which subsequently recommended that the AEC be advised that:

- The industry had a legitimate and active interest in the development of atomic power.
- The industry had qualified, experienced personnel to participate in the adaption of atomic energy to power use.
- The industry sought full opportunity to participate singly, in groups, or as an industry in the development of atomic energy for power generation.
- The industry asked Commission cooperation for assistance to those firms which then, or later, might make atomic power studies.

Later, the Committee presented a statement to the Joint Congressional Committee on Atomic Energy recommending these three changes to the Atomic Energy Act of 1946:

1. Permit industry to own source materials, fissionable materials, and related facilities.

2. Deal fairly with patent rights and incentives for new development.

3. Permit industry to obtain workable licenses from appropriate regulatory authorities for atomic projects.

"The Atomic Energy Act of 1954 did accomplish our basic aims," Dixon said, although some of the specific recommendations were not achieved.

He added:

"Notwithstanding this progress . . . public power proponents urged that we were falling behind in what they refer to as the world atomic power development 'race' principally because none of our plants was currently operating. As they expressed it, there were no bricks and mortar—just promises.

Has Confidence in Congress

"We know the public power crowd will be back in full voice when the next Congress convenes and nothing that we do—no gains we make—will convince them that our nuclear power development program is adequate. However, I do feel that progress, such as has been made and is presently indicated, will carry great weight with fair-minded members of the Congress, whom I believe are in the majority."

Because of those who believe the industry is confining itself to "too few of the several reactor types, and that there are other important types that should be developed," the industry committee currently is setting up a Technical Appraisal Task Force on Nuclear Power. It will be charged with:

- Keeping abreast of research and development work here and abroad that may lead to competitive nuclear power.
- Studying and reporting on all reactor programs and projects.
- Appraising technical and economic factors and results to be achieved by construction of full-scale nuclear plants of various designs.
- Reporting quarterly to the EEI Committee on Atomic Power and the EEI Board of Directors on its activities and findings so that member companies may formulate courses of action "which will be in the interest of assuring the most vigorous development of competitive nuclear power."

"This project is going to take some real money and tremendous effort on the part of some of our industry leaders."

Utility Presidents Meet to Discuss Industry Atomic Role

150 chief executives to attend Sept. 19 parley called by EEI Board. Will review participation, chart future course

One hundred and fifty electric company presidents will meet in New York September 19 to chart the industry's future course in developing nuclear power.

Called by a resolution of the Board of Directors of the Edison Electic Institute, the unusual, high-level meeting will review the current industry program and discuss the comparative position of U. S. development in relation to the nuclear programs of other nations.

Agenda for the meeting will include these topics:

1. Essence of the law with respect to nuclear energy.
2. Status of nuclear power development in the U. S. today.
3. Experience encountered in undertaking nuclear power projects.
4. Present global picture in the field and possible future developments both at home and abroad.

Will Select Task Force

The utility presidents will also select a chairman and members of a technical appraisal task force. Members for this ten-man group will be chosen from among electric utility representatives, independent nuclear engineers and scientists, and representatives of the equipment manufacturing firms.

This task force, created under an EEI Board directive, will review various reactor types and designs and recommend to individual companies those reactor types and designs which appear to have promise of feasibility for the production of electric power.

EEI Pres Donald S. Kennedy, president, Oklahoma Gas & Electric Co, will preside at the President's conference. Edgar H. Dixon, chairman of the EEI atomic power committee and also president of Middle South Utilities Co, will present speakers at the Sept. 19 meeting.

Max Ulrich, full-time executive secretary of the EEI atomic power committee, has been preparing for the President's meeting since his appointment to that position June 6. He is also charged with the responsibility of assisting the committee and other institute members in furthering the development of atomic power.

In the series of resolutions adopted by the EEI board June 6, the group also indorsed formation of a national evaluation team to provide a continuing means for the scientific, engineering, and economic evaluation of power reactor types and designs and selection of those meriting development and construction. Such a team would be independent of the electric utility industry, but the industry would hope to have representatives on it. Rep James Van Zandt (R.-Pa.) introduced a resolution in Congress providing for such a team, but failed to obtain legislative approval during the past session.

The EEI board decided to take a new look at industry participation in the nuclear power field at the time that Congress was considering several proposals for expanded federal development. A bill directing the Atomic Energy Commission to develop several large power reactors and a number of smaller ones was passed by the Senate, but killed in the House.

Argue Federal Program Needed

Proponents of the federal development bill argued that the U. S. position in nuclear power development was being jeopardized by the programs of Britain and Russia. They reasoned that a large federal program was needed to supplement the current free enterprise development being carried by electric utilities and other private industries.

The subject of expanded federal development is almost certain to come before Congress early next year when the Joint Atomic Energy Committee reviews the peacetime applications of nuclear energy. Under law, the committee must conduct such a review during the first 60 days of the session which begins in January.

AEC, along with the electric companies, opposed an expanded federal program in the past session of Congress. AEC said it already had authority to spur development of nuclear power.

Shippingport's 'Hot' Wastes . . .

. . . to be treated in special facilities providing for natural decay of radioactivity to 10% of maximum safe concentrations established by National Bureau of Standards

Jacques R. LaPointe, a Westinghouse Electric Corporation engineer, has described how radioactive wastes will be handled at the nation's first full-scale atomic-powered electric generating station now being built near Shippingport, Pa.

Speaking before the annual meeting of the Pennsylvania Sewage and Industrial Waste Association at Pennsylvania State University, LaPointe said that any air or water-borne waste from the plant will have such low radioactivity that no hazard to health or safety can exist.

Radioactive wastes at the Shippingport station will be treated by disposal facilities that provide for natural decay, concentration and storage and dilution. The system is designed to specifications which will allow waste materials to be processed in a way that any radioactivity present will be reduced to 10% of the maximum safe concentrations established by the National Bureau of Standards.

LaPointe explained that the waste disposal problem was simplified by the fact that the spent nuclear fuel elements will not be reprocessed at the Shippingport plant site itself.

All radioactive liquid, gaseous and solid wastes will be transported to the disposal facilities, most of which will be underground. There, the wastes will be segregated, processed or stored, and ultimately disposed of. How the plant waste will be treated will depend on the amount of radioactivity it contains and its form.

LaPointe is presently a supervising engineer at the Bettis plant in Pittsburgh, an atomic power research laboratory which is operated by Westinghouse for the Atomic Energy Commission.

The atomic Shippingport station, which is being constructed by Duquesne Light Co of Pittsburgh for the AEC, will be completed in 1957. Westinghouse, under contract to the Atomic Energy Commission, is building and designing the reactor portion of the plant.

New Washington Damsite Seen by Army Engineers

The Corps of Engineers believes that a potential water storage site has been found in north-central Washington and has ordered its Seattle district office to look into a scheme submitted by Carl R. Dion, Spokane engineer.

Dion believes two lakes and an "abandoned" river bed could be earth-and-rock-dammed to create a 4.5 million acre-ft reservoir that could produce 696,000 kw at its own generating facilities, and supply downstream flow for 600,000 extra kw, and flood control of 38,000 cfs.

The reservoir would be connected to Lake Roosevelt, behind Grand Coulee Dam, by a 29-mi. pair of canals, and would store water in Omak and Goose Lakes in north-central Washington.

During high-water, overflow from Lake Roosevelt could be pumped into the reservoir.

Cobb Unit Goes on Line

Consumers Power Co has placed in service the first of two new 156,250-kw steam generating units at the B. C. Cobb Plant at Muskegon, Mich., increasing the company's system capacity to a new high of 1,721,178 kw. Second unit is now under construction for service in 1957.

Utilities Challenge Havoc Like Betsy's

The force that hurricane Betsy inflicted last month on Yabucoa, Puerto Rico (above), bears the same brutal resemblance to the wake of last year's Diane storm. Five southern utilities which incurred Diane's wrath have set up a mutual aid program hoping to avert power interruptions in the current hurricane season.

Duke Power Co, Virginia Electric & Power Co, Appalachian Electric Power Co, South Carolina Electric & Gas Co and Carolina Power & Light Co have exchanged service area maps so crews can interchange line repair work to keep power flowing. Carolina Power has installed standby generators at five points to keep its communications system intact.

Soviet Slates Solar Station

The world's first "solar" power station, now being blue-printed in the Soviet Union's Academy of Science, is slated for construction in the Ararat Plains of Armenia S.S.R., which has the highest rate of sunshine and the greatest amount of heat transmitted by the sun in the U.S.S.R.

The station, which will serve an industrial purpose, will be encircled by trees to keep dust from the 1,293 huge mirrors. These mirrors, mounted on special carriages, will move about on the set of 23 railroad lines which will be constructed around the tower like spokes in a wheel pointing to the hub. Automatic relays are to hold the mirrors so that reflected sunlight will strike a steam boiler.

Flying Patrol Doubled

To improve aerial inspection of its electrical transmission lines, Saskatchewan Power Corp has doubled the number of planes on call by awarding one year contracts for aerial patrol to six Saskatchewan air line companies. Speedier detection and repair of line breaks and other causes of failure is expected from the new method by which each company will patrol a definite area of the utility's 15,000 mi of 72,000, 34,500, and 25,000-v line. In time of emergency the utility hopes to "blanket a trouble area with planes."

More Money for Power

The American Power Conference seeks to strengthen its financial position through a proposal that would request each utility, manufacturer, and other segments of American industry interested in power subjects to subscribe annually for $50 to $150 worth of proceedings, depending upon the extent to which the organization wishes to support APC. Each subscriber would be entitled to have at least one representative on the industry committee.

Sponsored by the Illinois Institute of Technology, this conference is the only national group devoted exclusively to power subjects. Now in its 19th year, having originally sprung from the Midwest Power Conference, the APC attracted 3,000 registrants last March.

Science Publication Slated

A multi-volume compendium entitled "The McGraw-Hill Encyclopedia of Science and Technology", written by 200 specialists and edited by 30 consulting engineers, is planned for publication by McGraw-Hill Book Co for completion in about three years. Designed as a complete reference work for the student, teacher, engineer, and scientist seeking information on scientific or engineering subjects, the illustrated 7,000-page encyclopedia will be revised as new developments in science occur. An annual publication, "The McGraw-Hill Yearbook in Science and Technology", which will cover in detail the developments of the previous year, is also being planned.

Northwest Conflict Grows

The public versus private power issue mounts increasingly in the Northwest political scene.

Kinsey M. Robinson, president of Washington Water Power Co, told New York Society of Security Analysts, "A handful of public power zealots are trying desperately to stall private development in the Northwest. . . . If the blockaders will stay off our backs, private utilities will lick the power shortage problem" in the region.

A debate on "Power and how it should be developed to the best interests of the people" will be staged by U. S. Senate contenders from Washington, Sen Warren B. Magnuson and Gov Arthur B. Langlie. Langlie extended the debate invitation in a TV-radio appearance in which he declared the Hells Canyon issue "is not one of 'public' versus 'private' power" but "a matter of a wasteful, gigantic political monument versus sound economic common sense." Privately financed low dams would provide lower-cost power than a high dam, he said. Taking issue with Langlie, State Grange Master A. Lars Nelson agreed "the issue is not private-vs-public power" but "one of maximum versus minimum development."

Automation: Key to Bliss?

Don't think that you can make a power plant worker any happier simply by mechanizing or automating some of his duties.

The real key to job satisfaction for the plant worker, says a recent University of Michigan study, is a feeling that one's assigned duties require the use of one's best knowledge and abilities.

The fact that automation in a plant gives workers greater mobility and more frequent contact with fellow workers has no significant relation to increased interest or satisfaction from a new job, according to the study. Nor do increased responsibilities necessarily make for more worker satisfaction, even though they hold more interest for him.

But increased use of automation does offer management an unusual opportunity to redesign and enlarge each job to make greater use of employee skills, and thus increase the worker's satisfaction in his work.

The University of Michigan study covered two comparable power generating plants, one built on conventional lines and the other incorporating recent engineering devices to further automate production.

Ohio Ed Turns to Automatic Dispatch

Electronic analyzer is expected to pay for self within two years by cutting system operating costs

Ohio Edison Co put its new electronic differential analyzer to work this week on integrated automatic system control. The unit is now in operation at the company's central dispatching center in Massillon.

The special-purpose analyzer makes calculations and then manipulates instantly via automatic controls the throttles of 35 steam-electric generating units in nine power plants. The plants are interconnected but are scattered over an area of 9,000 sq mi.

The company expects that the new analyzer will cut the system operating costs so much that it will pay for itself in less than two years.

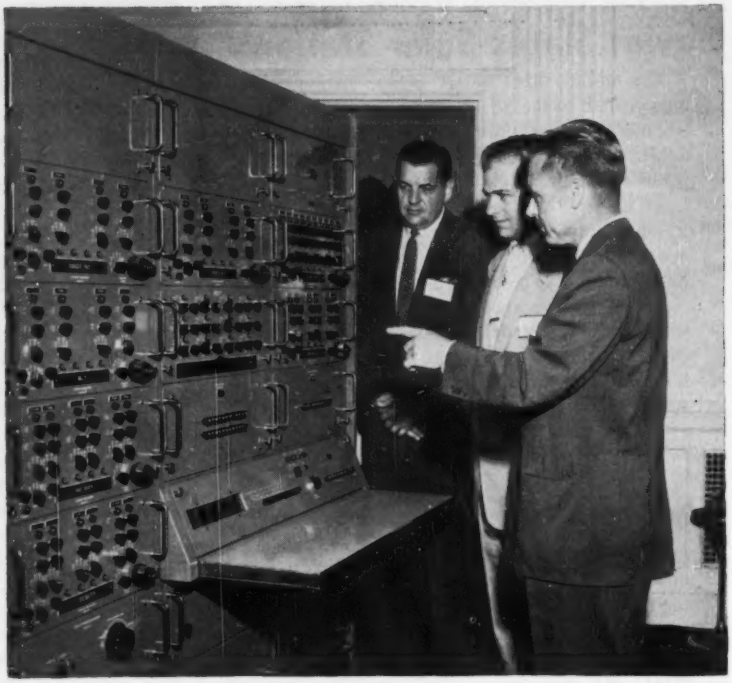
Ohio Edison recently invited about 45 electric utility representatives to inspect the unit immediately prior to its installation. Goodyear Aircraft Corp, the manufacturer of the analyzer, sponsored the day-long preview session.

The utility representatives heard papers presented by R. H. Travers, Ohio Ed's system operations engineer; S. B. Yokelson, development engineer for Goodyear Aircraft; S. B. Morehouse, Leeds & Northrup Co; and H. F. Davis, Minneapolis Honeywell Regulator Co. The analyzer's various capabilities were demonstrated to the guests in the afternoon.

Three-Year Research Revealed

Edison engineers saw possibilities a few years ago for the adaptation of the electronic differential analyzer to power system control. They worked for three years with Goodyear in developing the special-purpose analyzer. It is known as GEDA—the Goodyear Electronic Differential Analyzer.

GEDA had its beginning at the end of World War II when Goodyear Aircraft became involved in the development of guided missile systems. The many complicated calculations necessary in the program prompted research into an electronic calculator that could perform fast and accurate calculations. GEDA was the result, and the company developed several models for various uses.



NEWS IN BRIEF

ATOMIC

Construction of **France's first nuclear power plant** begins soon in the Loire Valley. To be completed in 1959, the 60-Mw plant will be operated by Electricite de France and may be expanded ultimately to 300-Mw capacity.

The Rhinisch-Westphalian Electricity Corp has decided **to buy an experimental atomic power plant** of 10,000 kw from the U. S. Cost of operation will be 2.5 times greater than for a coal plant—or twice as much as a plant using imported U. S. coal. However the utility wants the reactor for test purposes and will make it available to all West German firms on condition that they agree to a mutual exchange of information, and that they will choose a different type if they install their own reactor later.

U. S. Atomic Energy Commission used 56% of all electric power sold by Tennessee Valley Authority for the fiscal year ending June 30, 1956. AEC used 30.2-billion kwhr. Total TVA sales were up 28% over 42-billion kwhr for 1955.

REA, CO-OPS, AND MUNICIPALS

Because of "more efficient scheduling of needs by borrowers," applications for new **REA loans set a new low** since 1941. Applications Aug. 1 totaled $66.5 million. Backlog at start of fiscal year averaged $114 million since 1937, peak of $229 million hit in 1949.

Interior Department has authorized Southwestern Power Administration to construct immediately a 66,000-v transmission line and 3,750-kw substation to serve Bentonville, Ark.

Lowest electric rate in the nation is enjoyed by Monmouth, Ore., citizens, according to Northwest Public Power Association. NPPA says residents pay three-fourths of a cent per kw since the latest 5.6 residential rate cut and 20% commercial rate decrease . . . **Washakie Rural Electric Co** of Worland has asked Wyoming PSC for

(*Continued on page* 306)

TESLA:

Prophetic Genius

A centennial tribute to the creative visionary whose revolutionary inventions electrified the world

History, in spite of its haste, could not fail to record the new and remarkable inventions of the past century. Neither have the lives of their inventors gone unheralded. The paths of these elect have been followed, from their earliest development to the peaks of their careers.

Ironically, one who burst upon us fully equipped has faded into obscurity.

His contributions have been called "inextinguishable beacon lights in a great art and industry."

Contemporaries at the height of his career hailed him as a veritable wizard, the exemplar of our highest human ideals, Nature's favored son, and a strange genius with a cosmic mind.

The centennial of his birth is being honored this year by numerous engineering societies, among them the American Institute of Electrical Engineers, who will commemorate the anniversary at its Fall General Meeting.

The Yugoslav government this July conducted a four-day centenary celebration in his honor at Belgrade, attended by dignitaries from all over the world.

Yet, despite this seemingly universal recognition, this phenomenal man has today virtually passed into oblivion. Few people will have remembered hearing his name.

Who is he? Nikola Tesla.

His two most important inventions—the polyphase alternating-current system for transmitting electricity, and the induction motor—changed the whole course of the electrical engineering field and laid the foundations for the vast network of power lines that today stretch across the nation.

This remarkable though little-known man was born one hundred years ago this past July 10 in the town of Smiljan, Lika, a borderland of Austria-Hungary, the son of a Greek Orthodox minister and an inventor mother.

Even as a boy, Tesla showed his creative tendencies. His young but fertile imagination led him to create a motor powered by sixteen June bugs glued to what resembled a windmill.

While receiving his elementary education in Gospic and at the Higher Real School at Carlstadt, his talent for mathematics and his fabulous memory became apparent.

But most outstanding was a trait for which he later became famous—the almost super-human ability to visualize the tangible result of an idea at the same moment he conceived it. He demonstrated this in mathematics, where he would picture a blackboard and immediately visualize and recite the answers to the most complex of problems.

It had been planned that he train for the clergy, but as his studies developed a scientific bent, his parents gave their consent to his attending Polytechnic School at Gratz, where he specialized in electricity. He completed his education at Prague University.

During an interruption in his education following a cholera attack, Tesla devoted his time to experimenting with the various schemes his active mind had conceived. Among them was an under-ocean tube between England and the U. S. to transmit mail in spherical containers with the use of water pressure. The intense friction which would result on the side of the tube led to the rejection of this idea.

In 1881, the Government Telephone Engineering Department employed Tesla as an assistant engineer in Budapest. It was then that he invented his first electrical apparatus—the telephone repeater.

After several years in Strassbourg, where he installed, maintained, and repaired power station equipment, Tesla headed for Paris. There he served as an electrical engineer for Edison Electric Light Co, which was then developing the new electric lighting industry.

It was during this period that he constructed an alternating current commutatorless motor, a project he had previously envisioned and mentally designed in detail. To the original single wave he added a second, then a third, and produced—in his mind—the basis of a perfect and complete polyphase motor.

Unable to interest financial backers in developing the invention, he obtained a personal letter of introduction to Thomas A. Edison and embarked for the U. S.

DR NIKOLA TESLA, with one of his famous high-voltage research coils in the background, uses volume of "Scientific Papers" of Maxwell

Tesla joined the Edison Machine Works in New York and worked with the inventor designing motors and generators. Since Edison was primarily interested in direct current machinery, Tesla soon left, and in 1887, with the aid of two financial backers, established the Tesla Electric Company.

During the period between 1886 and 1903—considered his most productive in the electrical field—the prolific inventor applied for and received a string of patents on numerous, and often basic, inventions which have had a marked influence on the evolution of electrical engineering.

Among these were his system of arc lighting; the Tesla transformer; development of dynamos, condensers, and special coils; generators of electric oscillations; the high potential magnifying transmitter; and the discovery of stationary electrical waves in the earth.

But most significant was his discovery of the polyphase alternating current and the system by which it could be put to practicable use. This revolutionary invention was announced by Tesla in May 1888 in a lecture to AIEE. In the accompanying demonstration he produced mechanical rotation with the aid of his two-phase induction motor.

In the latter part of the 19th century, the dispute between proponents of ac and dc reached new heights over the means by which the tremendous energy of Niagara Falls would be converted to supply the greatest amount of electricity most efficiently and economically. A world-wide search, led by the International Niagara Commission, was begun to find the best method of harnessing this power.

Until Tesla's discovery, backers of alternating current, were handicapped by lack of successful ac motors. Then, in 1888, George Westinghouse realized the significance of Tesla's system. Westinghouse secured Tesla's services and acquired rights to his patents.

Meanwhile two isolated events on opposite sides of the globe helped bring Tesla his first public triumph. One was the 1891 Frankfort Exhibition, where power was transmitted 100 miles from the Lauffen waterfall by means of the three-phase system based on the Tesla principle. The other was the 1893 Chicago World's Fair where a complete polyphase system—a 500 hp induction motor, driving a two-phase generator—provided power for motors and lamps and for dc apparatus by means of rotary converters and motor generators. A spectacular result was a display of 90,000 bulbs illuminated by 12 Tesla generators.

The demonstration was so convincing that—despite the warnings of such dc advocates as Edison and Lord Kelvin, and the submission of bids from 17 competitors from six nations—the Tesla system was adopted in 1893 for the first great hydroelectric plant, located at Niagara Falls. This plant, which started operation in 1895, ushered in the age of electric power.

Westinghouse Co, which held the patents, was awarded the contract for three 5,000-hp Tesla generators, the world's largest at that time, and later seven more units were installed to complete the 50,000 hp of the station.

In 1889, prior to the adoption of his system at Niagara Falls, Tesla left Westinghouse and plunged into numerous fields of investigation at his New York laboratory.

Working and living according to a rigid regime, eliminating almost all contact with others, Tesla devoted his energies to simultaneous experimentation in high frequency phenomena, a system of wireless transmission of power, and electrical illumination by gas-filled tubes, forerunner of neon and fluorescent lighting.

His interests increasingly centered on high frequency, a field which occupied most of his attention for the rest of his technical career.

The most widely known invention during this period was the Tesla Coil, the first application of what is known today as the "coupled oscillatory circuit."

For his pioneering in the high frequency field and for his inventions and discoveries made several years before the experiments of Marconi and others, some contemporaries called Tesla the "Father of Wireless."

Some achievements of this period include high frequency generators for producing continuous waves, rotary and series spark gaps, oil-insulated transformers and condensers, mica condensers impregnated with wax under vacuum, stranded conductors, aerial and ground connection, selective tuning by beat waves or heterodyning, arcs for producing continuous waves, "ticker" for receiving continuous waves, and choke coils.

Whatever project he was absorbed in Tesla felt compelled to pursue at the expense of discarding any ideas, no matter how revolutionary, whose possibilities did not apply to the project at hand.

Before 1897, the year Marconi received his first wireless patent in the U. S., Tesla devised boats, cars, and other movable objects that could be maneuvered completely by radio waves.

One of these vehicles, a weird crewless craft, appeared off the New York shore in 1898. It was the first practical telautomaton with its own motive power, propelling and steering machinery, controlled from a distance without wires by transmitting electrical oscillations to a circuit carried by the boat and adjusted to respond only to these oscillations.

His visions in the wireless art knew no bounds. In 1908 he predicted "It will be possible for a business man in New York to dictate instructions and have them

instantly appear in type at his office in London. . . . An inexpensive instrument, not bigger than a watch, will enable its bearer to hear anywhere, on sea or land, music or song, the speech of a political leader, the address of a man of science, or the sermon of an eloquent clergyman delivered in some other place, however distant. In the same manner any picture, character, drawing, or print can be transferred from one to another place. Millions of such instruments can be operated from but one plant of this kind."

In his later years Tesla set as his goal the wireless transmission of electric power and established a new laboratory at Colorado Springs. Although no complete records of his experiments there exist, he reportedly constructed a coil of such tremendous size that during one experiment he burned out a generator.

He was also said to have succeeded in illuminating lamps and operating small motors more than 15 miles from the laboratory by his wireless method. In one of his Colorado Springs experiments, Tesla produced artificial lightning crashes of many millions of volts and up to 135 ft long—the most powerful discharges ever achieved by man.

Near the close of his strictly regimented and lonely life, Tesla claimed to have invented a "death beam" powerful enough to destroy 10,000 airplanes at a distance of 250 miles and to annihilate an army of 1 million soldiers instantaneously.

Aside from the death ray scheme, most of Tesla's inventions and prophecies became reality—the synchronous electric clock, radar, facsimile, broadcasting, and mechanical power.

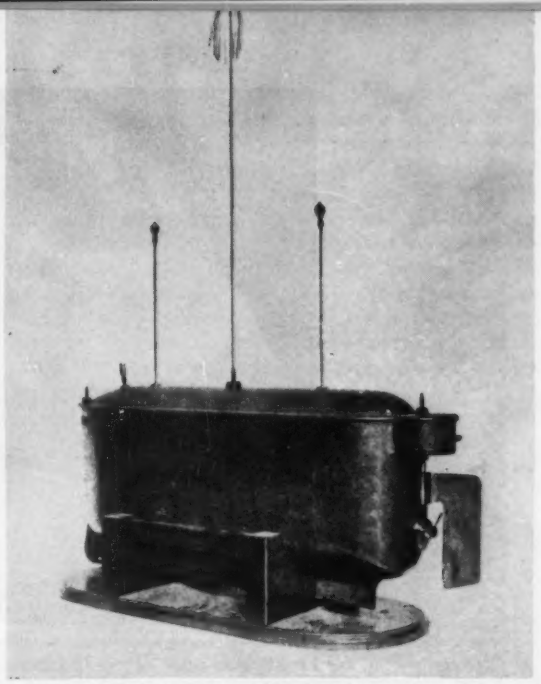
One of Tesla's life-long characteristics was his indifference to the commercial side of his work. Ideas not immediately adaptable were discarded and left to others to develop. Funds he received from his patents were instantly spent on further research. In addition, he neglected to collect a large portion of the royalties due him for his more than 100 patents. (a large number of the 700 devices he invented were never patented).

In one of the 70 tributes written to Tesla on his 75th birthday, Charles F. Scott, then chief electrical engineer of Westinghouse, said, "Tesla's fertile imagination often constructed air castles which seemed prodigious. But I doubt whether even his most extravagant expectations for the toy motor . . . measured up to the actual realization. For the polyphase system which it inaugurated is the basis of the electric transmission and power service of today, exceeding in magnitude and usefulness and promise for the future the wildest dreams of the early days."

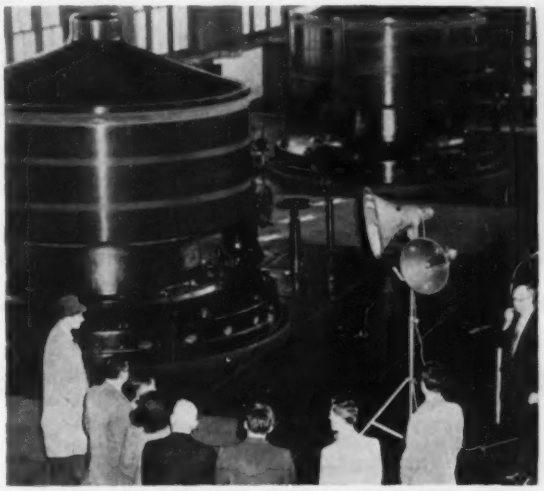
L. W. W. Morrow, then editor of Electrical World, to which Tesla frequently contributed, wrote ". . . your name has long been held up to the electrical industry both as a contributor to its development and as an example for others to follow. To the father of the induction motor and the exemplar of our highest human ideals we render grateful thanks . . ."

The life of this visonary and prolific genius ended on January 7, 1943, in his New York hotel room, where he died alone at the age of 86.

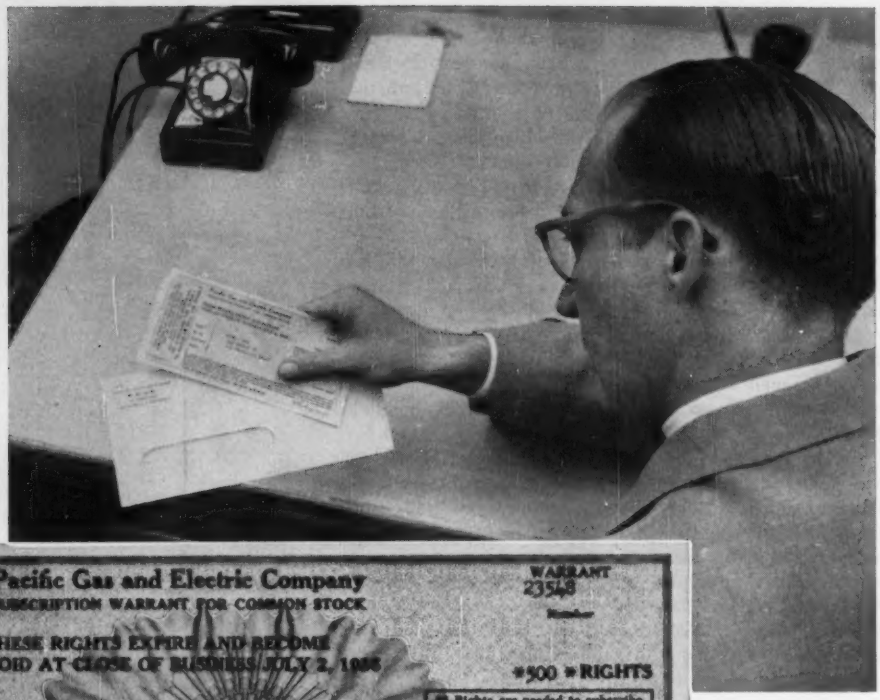
But he left behind a mass of papers, which have yet to be thoroughly examined. Recently these papers were set up in a special Nikola Tesla Museum in Belgrade. They may very well contain the clues to undreamed-of realms to conquer in the field of science.

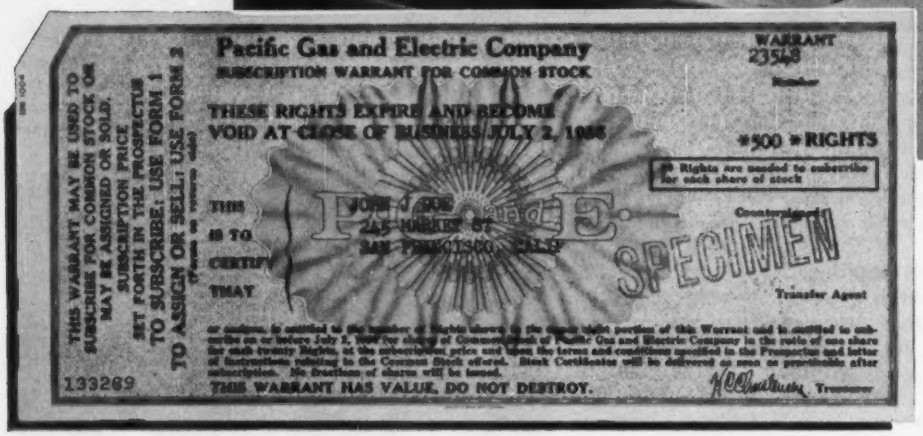


FORERUNNER OF TODAY'S GUIDED MISSILES, Tesla's 7-ft tel-automaton was controlled from a distance without wires by transmitting electrical oscillations to a circuit in the boat



STILL RUNNING STRONG at Adams station, Niagara Falls, are these 5,000-hp polyphase generators installed in 1895. Nameplate on 1897 unit (No. 6) lists nine Telsa patents




Pacific Gas and Electric Company
SUBSCRIPTION WARRANT FOR COMMON STOCK
WARRANT
23548
THESE RIGHTS EXPIRE AND BECOME
VOID AT CLOSE OF BUSINESS JULY 2, 1956
*500 *RIGHTS
* Rights are needed to subscribe for each share of stock
THIS IS TO CERTIFY THAT
SPECIMEN
Transfer Agent
THIS WARRANT MAY BE USED TO SUBSCRIBE FOR COMMON STOCK OR MAY BE ASSIGNED OR SOLD.
SUBSCRIPTION PRICE SET FORTH IN THE PROSPECTUS
TO SUBSCRIBE: USE FORM 1
TO ASSIGN OR SELL: USE FORM 2
133289
THIS WARRANT HAS VALUE. DO NOT DESTROY.

High-Speed Machines Turned Out This Warrant. It's the Answer to . . .

Cutting Costs of Stock Subscriptions

- **Pacific Gas & Electric adapts high-speed electronic and mechanical machines in preparing subscription warrants**
- **New methods save $24,000 over conventional costs and do the job faster, more accurately, with less personnel**

Pacific Gas & Electric Co is one of the first American companies successfully to adapt high-speed machine methods in preparing subscription warrants for a new stock issue.

PG&E's stock transfer department used these modern methods to process 130,000 warrants—one for each stockholder—in a recent offering of 812,971 common shares.

The result—a $24,000 saving over the cost of conventional methods. The new system does the job faster, more accurately, and with less personnel.

Under conventional methods, the big time consumer is sorting and checking by hand. PG&E formerly used an Addressograph to address the old 8-by-12-in. warrants and a check protector to imprint the number of shares on the warrants.

The company got special permission from the New York Stock Exchange to try the new method as an experiment. This okay was necessary because the new warrants do not meet the size requirements of the exchange. They are printed on 3-by-8-in. IBM tabulating cards.

The warrants are lithographed on these cards by American Bank Note Co. PG&E processes them at speeds up to 11,000 cards per hour. An Addressograph machine, handling 7,200 cards per hour, punches the warrant number, imprints the name and address of the stockholder, countersigns the transfer agent's signature, and produces a tabulating card for record purposes.

Equipment leased from International Business Machines Corp records the number of rights, strikes a balance by ledgers, and sorts the warrants for mailing zone. And then, in a single mechanical operation, the cards are enclosed in envelopes, sealed, and counted.

Brokers and subscription agents applaud the new system. It enables them to use mechanical methods when they process the warrants for their customers.

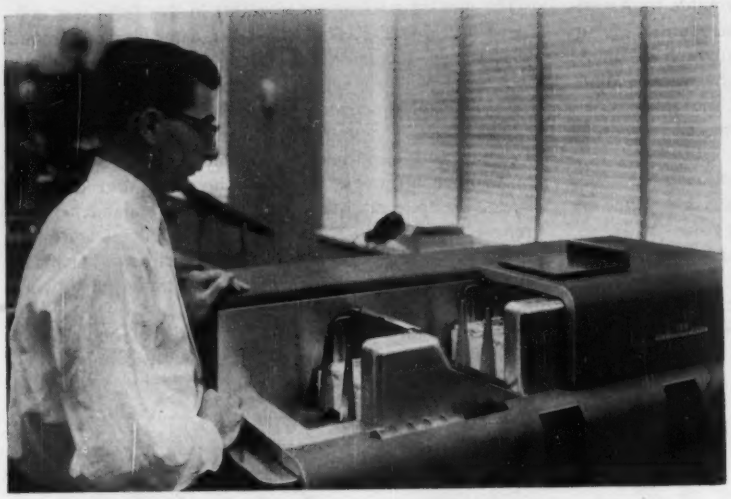
The idea of putting out warrants in this form was conceived by Edward F. Hall, PG&E transfer agent. Edmond E. Manhard, secretary, secured approval from the Stock Exchange. And Vic Wittler, tabulation supervisor, worked out the actual processing procedures.

Pacific G&E's stock transfer department uses its battery of high-speed electronic and mechanical equipment for many other purposes. The machines turn out dividend checks, compile statistics, handle proxy statements, and prepare annual reports and reports for federal and state governments. Other departments have their own machines, but the stock transfer equipment is sometimes put to work on payroll or auditing jobs too.

Here is a step-by-step picture account of how Pacific G&E used modern methods to issue stock warrants:

1 The warrants are first fed through a 9300 Addressograph. It imprints the name and address of the stockholder, punches the warrant number, countersigns the transfer agent's signature, and produces a tabulating card for record purposes

2 The IBM 077 card collator matches the warrants against the master deck of stockholders to make sure that there is a warrant for each shareowner. The master list is on IBM cards because PG&E uses it for other operations too



3 Then the IBM 519 reproducing machine punches mailing information and number of rights. It picks up this data from the master deck of stockholders which is processed simultaneously with the warrants

4 The IBM 416 accounting machine takes over and prints the number of rights on each warrant. It also totals the number of rights for the separate groups of warrants processed

5 The warrant number is printed in the upper right corner of the warrant by the IBM 552 card interpreter. Here a PG&E operator inspects the control panel before inserting it into the card interpreter

6 Final check is made by the IBM 101 electronic statistical machine which totals the number of rights. It also sorts the warrants for mailing. Then an enclosing machine (not shown) stuffs the warrant and instructions into an envelope and seals and stamps it

7 When the warrants are returned, PG&E must correct its master list of stockholders. It uses the IBM 024 card punch machine to punch the new number of shares into the old master card. Next, a new card is prepared, and the reproducing machine (Caption No. 3) transfers all pertinent information from old to new master card

8 Then the IBM 602A calculator punches earnings and total dividend based on the new number of shares. And the accounting machine (Caption No. 4) makes further checks. It compares number of shares and dividend on old and new cards

St. Lawrence Power Project Will Produce 1,800 Mw

Sponsored by United States and Canada cost will be $562 million. Schedule calls for completion in 1959

JOHN SALOMA, Electrical Engineer, Uhl, Hall & Rich, Boston, Mass., Engineers for the Power Authority of State of New York

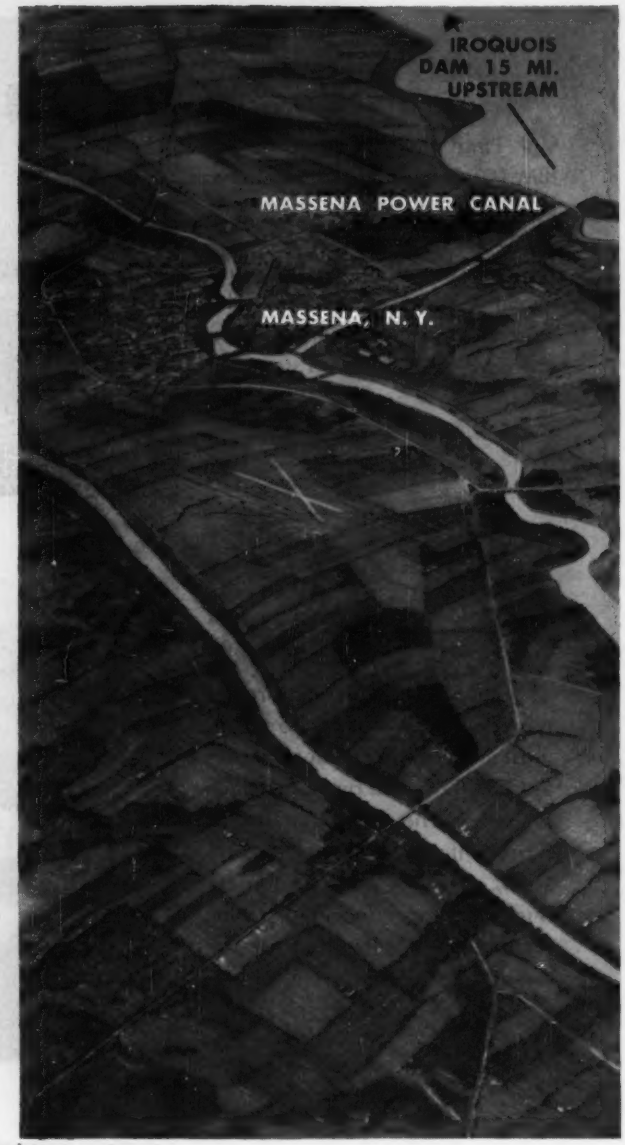
The power facilities for the St. Lawrence Power Project will be concentrated at the Barnhart Island powerhouse. The capacity will be 2.2 million hp or 1,800 Mw, half of which will be American. The power project is being jointly designed and constructed by the New York State Power Authority for the United States and the Hydro Electric Power Commission of Ontario for the Canadians. Estimated cost of the entire project, including in addition to the power plant, two control dams, an intake structure, channel works, dikes, etc, is approximately $562 million of which the New York State Power Authority will have to provide $291 million. The cost is evenly divided between the two entities except for the cost of powerhouse equipment. This equipment will be purchased, installed, and operated by the individual countries.

Power plant will contain 32 57-Mw generators. This article will discuss the electrical features of 16 generators and associated equipment in the American part of the power plant.

In addition to the sheer magnitude of the project and the numerous concrete and hydraulic problems encountered, several electrical features stand out. Among them are:

1. Water-cooled main power transformers.
2. Reduced basic insulation levels for main power transformers.
3. Isolated-phase bus for generator main leads.
4. High voltage 115-kv and 230-kv pipe-type cable for connections from main power transformers to switchyard.
5. All aluminum buses in switchyard.
6. Automatic starting and synchronizing of generators for control room.
7. Plastic prismatic lens luminous ceiling in control room.
8. Mercury vapor lighting in switchyard.

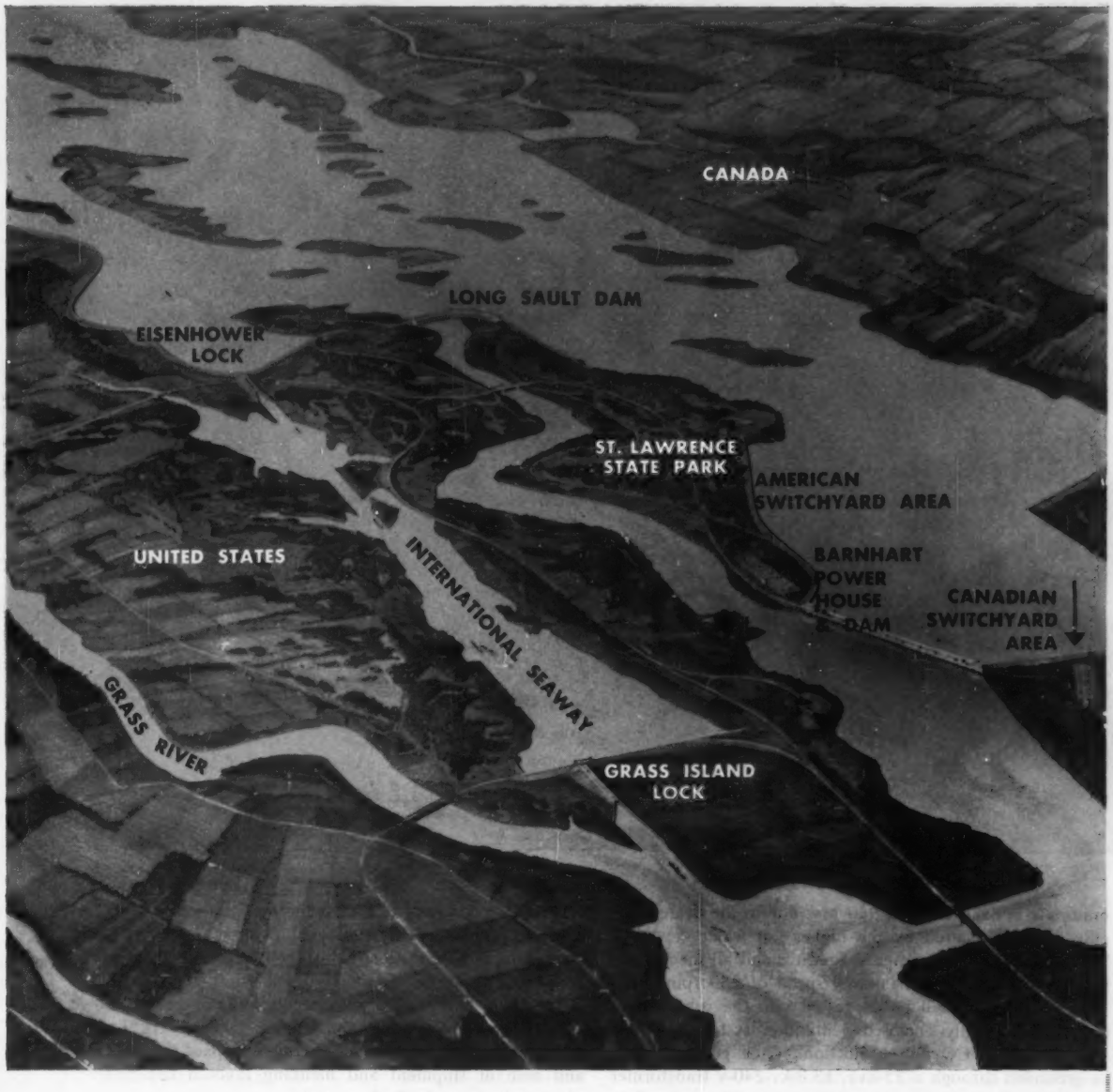
The power plant will have 32 generating units, 16 on the American side and 16 on the Canadian side. The generators will have a nameplate rating of 57 Mw or 60 Mva at 0.95 pf and will operate at 94.73 rpm, 13.8 kv, 3-phase, load. However, the maximum output of all 16 U.S. gen-



The St. Lawrence River originates at the outlet of Lake Ontario and drains the largest body of fresh water in the world—the five Great Lakes. These lakes form an enormous natural regulating reservoir which smooths out the surges and variations of flow from all tributary streams within the watershed and tends to equalize the flow from season to season. In fact the maximum flow on record is only a little more than twice the minimum flow, ie 314,000 to 144,000 cfs.

Below Lake Ontario the river drops about 92 ft in less than 50 miles through the International Rapids.

Three dams will be built to take advantage of this head. One, the Iroquois Dam, will be located near



Iroquois, Ontario, and the other two, Long Sault Dam and Barnhart Island Power Dam will be in the vicinity of Massena, N. Y. Power will be developed only at the Barnhart Island Power Dam. The other two dams are for water regulatory and control purposes only.

Iroquois Dam will regulate stream flow from Lake Ontario into the Barnhart Island powerhouse forebay holding the water level at Lake Ontario within limits prescribed by the international agreement. The dam will consist essentially of a buttressed gravity concrete structure with gate-controlled sluiceway openings of sufficient size to regulate the highest river flow.

Long Sault Dam will close the south river channel near the head of Barnhart Island. It is a concrete gravity dam with its axis curved upstream. Overflow-type spillway, controlled by vertical lift gates, regulates the forebay water elevation and discharges any flows which are not passed through the powerhouse. The maximum height of the dam above foundation is 145 ft. The dam will raise the water level about 90 ft above the river bottom.

Barnhart Island Power Plant consists of a massive concrete intake structure and the powerhouse itself which is directly downstream from an integral with the intake 162 ft above the lower point of the draft tubes. Maximum power head will be about 87 ft.

erators is limited to about 940 Mw due to the decrease in effective head caused by the higher tail water elevation. These generators are designed to withstand all mechanical stresses at a maximum runaway speed of 230 rpm.

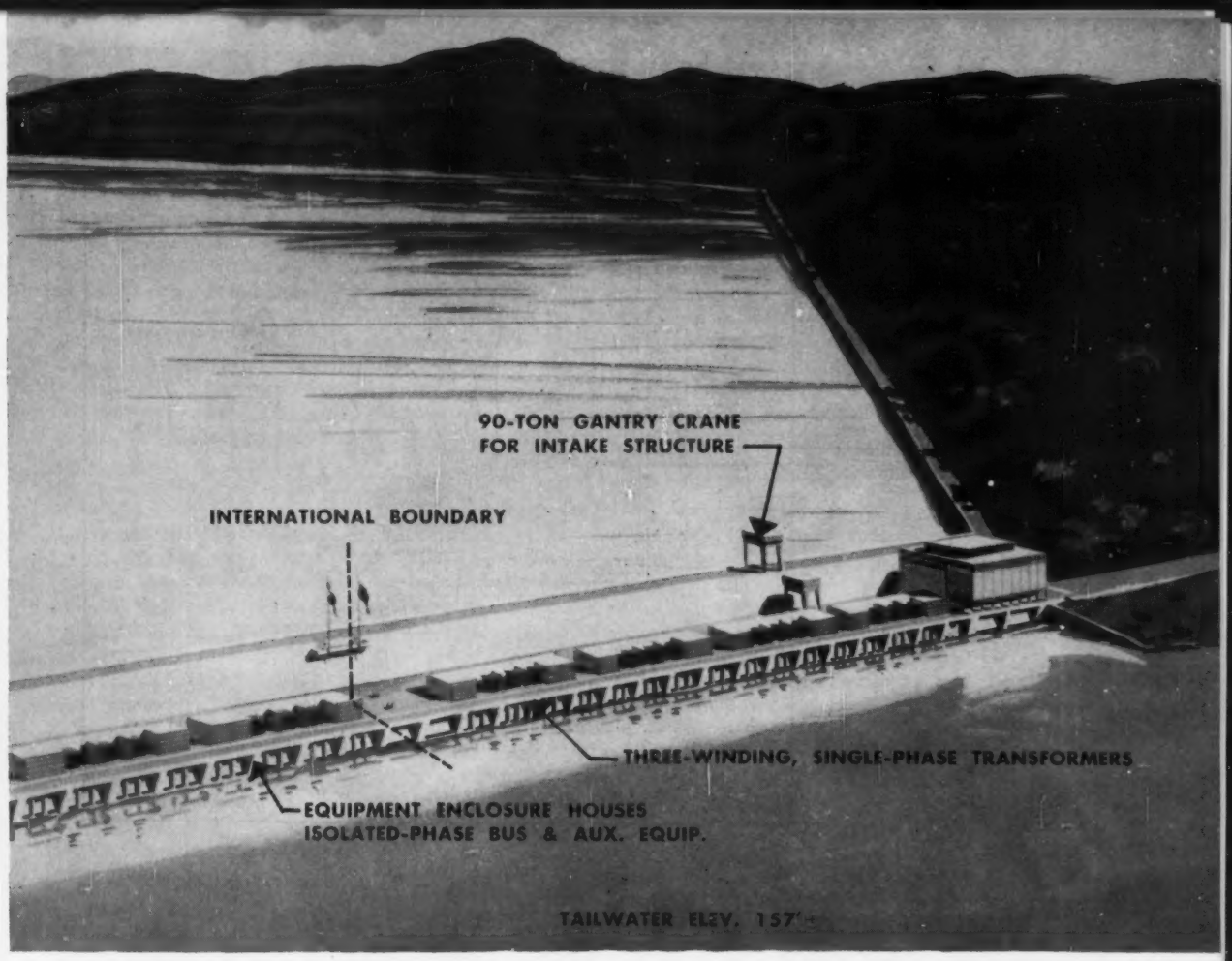
The generators will be depressed into the substructure and have a totally enclosed ventilation system provided with automatic CO_2 fire protection. Each generator will be grounded through a 75-kva, 13.8-kv-240-v transformer with a resistor bank connected across the secondary providing a high impedance type of grounding—it was decided to locate the main step-up power transformers on the draft tube deck as close to the generators as possible in order to keep the length of the 13.8-kv generator leads to a minimum. Four generators are grouped in parallel and are connected to one transformer bank, thereby keeping down to a minimum the number of transformer banks and high voltage circuits. In fact, only four transformer banks and four high voltage circuits are required to handle the entire 940 Mw output of the American side.

Paralleling generators requires a circuit breaker for each generator for synchronizing or isolating the generator from the system should it be necessary. Generator specifications require that the subtransient reactance should not be less than 25% so as to keep available short circuit current at the generator within the interrupting capacity of 1,500-Mva breakers. In addition, it was decided to use 3-winding step-up transformers with two 13.8-kv windings and two generators connected to each winding. All windings have standard impedances for this type and rating. Under these conditions it was possible to use generator breakers rated 14.4-kv, 1,500-Mva. The next larger size breaker, a 2,500 Mva, would have cost approximately $20,000 more.

A three single-phase transformer scheme per four-generator group was selected. Economy, space limitations, and ease of shipment and handling favored the single-phase units over the 3-phase units.

The transformer banks have a capacity of 258 Mva each. This is almost equal to 115% of the full load rating of four generators. Water-cooled transformers were selected on the basis of economy because the supply of water was not a problem. Two of the four transformer banks will step up the voltage from 13.8 kv to 115 kv while the other two banks will step up the voltage to 230 kv. There will be a spare single-phase transformer which can operate at either stepped up voltage.

The basic insulation level for the 230-kv transformers will be 825 kv (U. S. standard, 900 kv), and the BIL for the 115-kv transformers will be 450 kv (U. S. standard, 550kv). This is in keeping with the recent trend to reduce basic insulation levels because present day lightning arresters permit much better protection and coordination than those of a few years ago. Industry studies have indicated that it is impossible to get surges on this installation which will endanger the 825-kv BIL transformers if proper shield



wires are installed and if the resistance to ground at the first outgoing towers and the switchyard is maintained within certain reasonable limits.

Only with a direct stroke on the first tower from the switchyard and with only one high voltage cable in service would the lightning arrester at the transformers discharge at 600 kv.

Despite the apparent lack of need for lightning arresters at the transformers, it was decided to install them to provide a greater margin of safety. The expenditure of $40,000 is a small investment compared to the saving of $225,000 resulting from reducing the BIL of the transformers.

The single-phase power transformers will be isolated by concrete fire walls and will be equipped with a fog spray system for fire protection.

An isolated phase bus arrangement was selected to connect four generators to a transformer bank. Four identical installations are required for the American side. The use of the isolated phase bus system practically eliminates the possibility of a phase-to-phase fault inasmuch as the phase conductor must first come in contact with the metal housing which is solidly grounded. Although the isolated phase bus system is expensive, it is justified because of the lower installation cost, safety, and neatness in appearance.

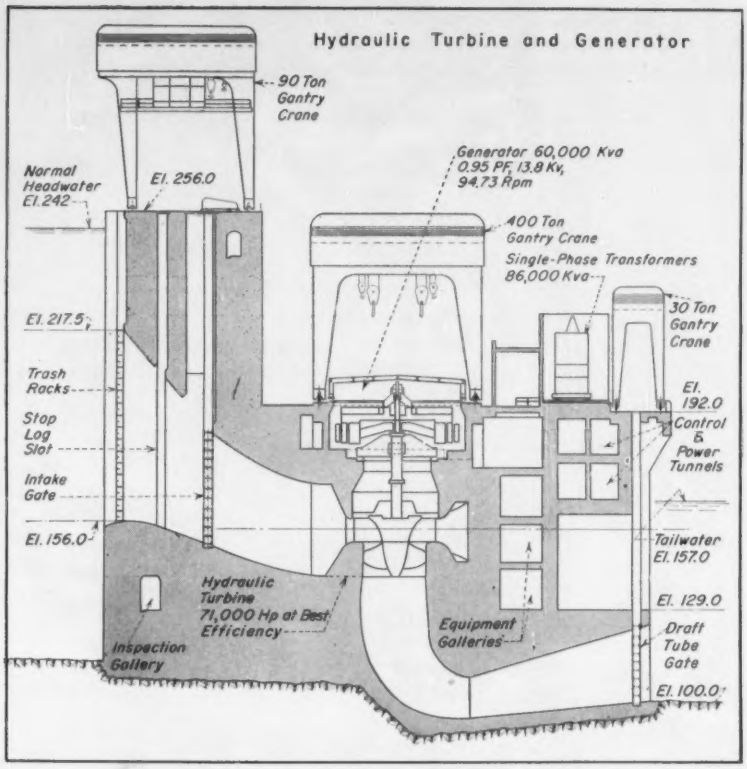
Between each generator and its breaker a tap will be made from the isolated phase bus to the generator surge protection and potential transformer cubicles. Surges endangering the generator insulation may not be encountered in this installation, but an expenditure of $4,000 per generator is well justified to insure against any possible surge damage.

Station service power for auxiliaries directly connected with the operation of the unit will be supplied from a 750-kva, 13.8-kv-480-v dry type transformer energized from the generator bus between two generator breakers. Each 750-kva transformer will serve two generators.

Power for other auxiliaries such as the cranes, station heating, etc, will be provided from four 1,000-kva 13.8-kv-480-v dry type transformers, energized from the tertiaries of two autotransformers. These transformers will also serve as a reserve power supply for the unit auxiliaries.

The capacities of the station service transformers were held to 750 or 1,000 kva to limit the short circuit current on the secondary system to values which 35,000-amp breakers can handle. These transformers will be an integral part of unit substations with drawout type low voltage breakers. The station service voltage on the American side will be 440, while the Canadians will use 550 v. A 440 - 550-v tie feeder will be provided between the American and Canadian sections of the powerhouse. The capacity of this tie is limited to 500 kva providing emergency station service power.

Design capacity of each turbine is 71,000 hp at the point of best efficiency when operating under a net head of 81 ft. Fixed blade propeller type turbines with a speed of 94.7 rpm will be used. Estimated cost of each hydraulic turbine is about $1.44 million



Power will be distributed from these unit substations to motor control centers and unit power panels. Those serving vital auxiliaries such as bearing and governor oil pumps will be provided with feeds from two sources.

A high voltage high pressure oil pipe-type cable installation was selected to transmit the power from the main step-up power transformers to the switchyard. On most power projects the installation of a cable system at 115 or 230 kv is not economically justified because the overhead system is ordinarily less expensive. On this installation there was also a slight economic advantage in favor of the overhead lines, but they would require bulky structures at least 150 ft high. Furthermore, the distance between the transformers and switchyard is so short that additional problems in terminating the overhead lines, which could not be anticipated at the time, would undoubtedly be encountered. In the final analysis, the superiority of the cables from the standpoint of aesthetics, maintenance, reliability has been found to outweigh any slight differential in cost.

The Barnhart Island power plant will have four cable tunnels located on the draft tube deck, two for the high voltage cables and two for the low voltage power and control cables.

The bottom power tunnel will carry two 230-kv high pressure oil pipe-type cable circuits from the transformers to the switchyard, each circuit consisting of three 1,500-MCM copper cables in a 8⅝-in. pipe. The top power tunnel will carry two 115-kv circuits, each circuit consisting of two pipe-type cables in parallel. Each pipe will be 6⅝ in. in diameter with three 1,500-MCM copper cables.

Both cable systems will have their own dual pumping units to maintain an oil pressure of 200 psi, and under normal conditions each will operate independently of the other. In an emergency one pumping unit can handle both the 115 and 230 kv systems.

The two control tunnels will have expanded metal cable trays on both walls for low voltage power and control cables between the individual generating units, switchyard, and the main control room. All four tunnels will be ventilated so that the ambient temperature will not exceed 40C.

The switchyard design is based on a double bus, breaker-and-a-half scheme using three breakers per bay for switching two incoming or outgoing lines. This scheme also provides for two separate and equally reliable buses which will normally be energized at all times. All switching and load transfer will be done by power circuit breakers operated from the main control room in the powerhouse.

For reasons of economy aluminum buses will be used in the switchyard. The main buses will be 2½ or 3-in. aluminum tubing, supported by pedestal type columns. The upper bus system, connecting the incoming supply and outgoing lines to the cross buses, will be a strain type bus made up of 795 MCM aluminum cable.

Each of the two 230-kv buses will be connected by means of a bus tie autotransformer to the corresponding 115-kv bus. The two autotransformers will be identical and will be rated 3-phase, 120 Mva, 230-115-13.8 kv. The autotransformers will provide for an interchange of power between the 230 and 115-kv buses. The 13.8-kv tertiary of each autotransformer will supply power to one section of a 13.8-kv switchgear, located in the switchyard service building.

This 13.8-kv metalclad switchgear will consist of two sections which may be connected together by means of a bus tie breaker. Each section of the switchgear will supply power to such loads as the station service, switchyard, Long Sault Dam, and the Eisenhower and Grass River Locks of the St. Lawrence Seaway.

All generators and high voltage power circuit breakers will be controlled from one central control room located at the Barnhart Island end of the power house. Most of the instruments, relays, and control switches needed for the operation of this station will be mounted on a combination duplex benchboard type instrument, control and relay board located in the control room. A separate duplex board will be provided for all recording instruments.

Because of the long distances involved there will be cases where some of the relays, such as the generator differential relays, will be located near the units. Each generator can be started automatically by a control switch on the benchboard in the main control room. The operator, by turning this control switch to the "Start" position, will energize a master contactor which will automatically start all necessary auxiliaries and the unit in the proper sequence and put the generator on the line through automatic synchronizing.

A load frequency control system will be installed with load dispatchers' equipment in the main control room. The system will be designed so that any number of units can be on base load while the rest are under load frequency control.

A unit control board will be located adjacent to the unit on the turbine or operating floor with necessary controls and instruments to permit manual control. The unit can be started from the unit control board and brought up to no-load speed. Then the control room operator will take over.

Control power will be supplied by three separate 125-v batteries, two of which will be located in the powerhouse, and one in the switchyard service building. Each of the batteries will be equipped with a battery charging motor generator set and all three batteries will be interconnected.

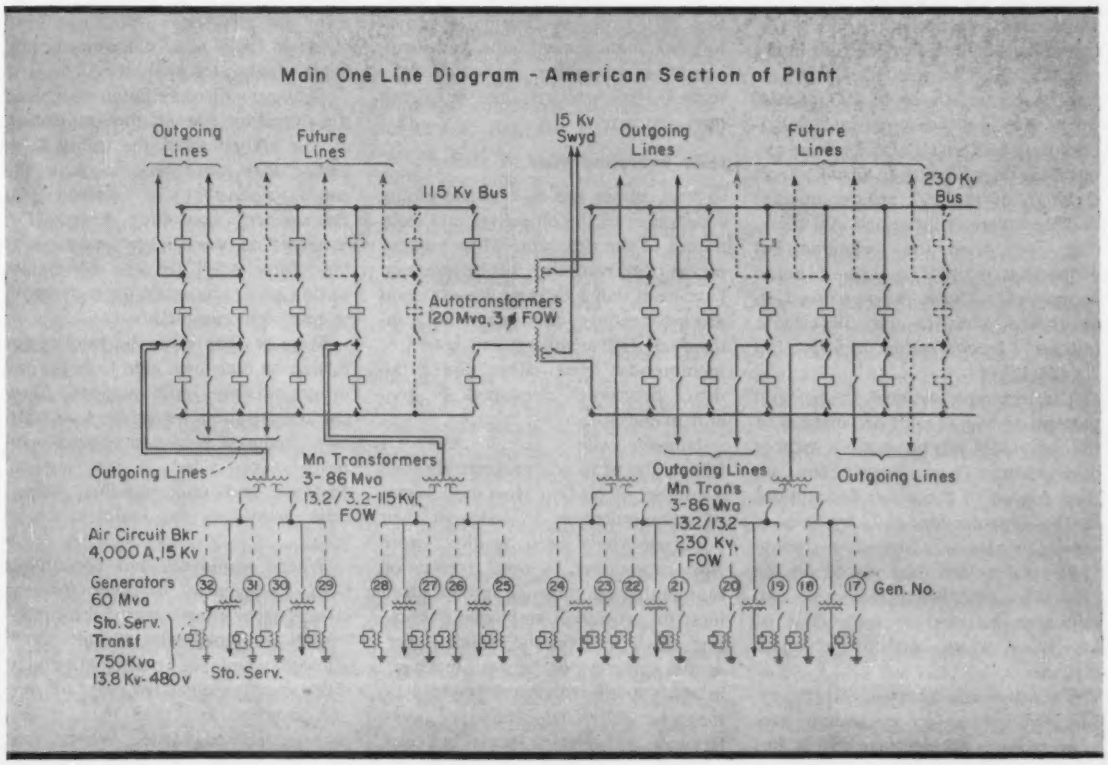
A complete annunciator system will be provided to sound alarms and indicate abnormal conditions. Complete annunciation for the units will be at the unit control boards with many of the important points duplicated in the control room. Switchyard annunciation will be in the control room only. A paging system which is selective to individual 10-ounce pocket-size receivers carried by key personnel will be installed to replace the conventional code call system.

The power plant lighting system will be served from a 4-wire 208Y/120-v distribution system while the switchyard lighting will be on a 480Y/277-v system. Because the switchyard lighting system will be predominantly mercury vapor and the area to be served very large, the higher voltage system was selected. Using such a system, a great saving in copper is realized, and the problem of voltage drop is reduced to a minimum.

To accentuate the huge massive concrete intake structure, mercury vapor flood lights will be used to illuminate it to an intensity of about five foot-candles. The outside generator deck will be illuminated with recessed wall-

(*Continued on page* 302)

SINGLE-PHASE THREE winding transformers are used to step up the generator voltage. Two generators are connected to each of the low voltage windings making a total of four generators for each bank of main power transformers


Main One Line Diagram - American Section of Plant
Outgoing Lines
Future Lines
115 Kv Bus
15 Kv Swyd
Outgoing Lines
Future Lines
230 Kv Bus
Autotransformers 120 Mva, 3 ϕ FOW
Outgoing Lines
Mn Transformers 3-86 Mva 13.2/3.2-115 Kv, FOW
Outgoing Lines
Mn Trans 3-86 Mva 13.2/13.2 230 Kv, FOW
Outgoing Lines
Air Circuit Bkr 4,000 A, 15 Kv
Generators 60 Mva
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 Gen. No.
Sta. Serv. Transf 750 Kva 13.8 Kv-480 v
Sta. Serv.

Utilities Use Modern Techniques to . . .

Set Wage Structures That Are Fair

- Recent survey of 193 utilities shows 54 have formal job evaluation programs in effect, and a number more plan to install them
- Main objectives: more equitable salary administration and a more systematic method for determining relative worth of jobs.
- 29.7% find the technique "highly satisfactory." Another 64.8% find it "satisfactory."

ELIZABETH LANHAM, Ph.D., Associate Professor of Management, College of Business Administration, University of Texas, Austin, Texas

Salary and wage scales are among the tough problems facing utility management today. Upon their equitable solution depends the loyalty, the morale, and the availability of present and future work forces. As the operations of utilities expand and become more complicated, the need for sound and equitable salary and wage scales becomes more sharply defined.

As an aid to solving these problems, an increasing number of utilities are turning to "job evaluation" programs. Little used by utilities ten years ago, this management technique for putting a dollar value on jobs is catching on fast. A recent survey of 193 utilities shows that 54 now have formal evaluation programs, and a number more are installing or planning to install them. Only 76 of the 193 utilities queried said they weren't interested. Of these, four have tried the technique but dropped it mainly because of union opposition. Those now using job evaluation plans include 39 electric utilities, 12 combination utilities, and 3 gas utilities.

The technique assumes this general pattern: It begins with an analysis of the individual job to obtain a written description. These descriptions are then related to other job descriptions in the organization and, by one of several systems, assigned a rating. Dollar values are then placed on the ratings by establishing maximum and minimum salaries for each class of jobs based on its worth to the organization.

Yes, it's as complicated as it sounds. Initiation of a job evaluation program requires an extensive effort. But there is considerable reward. Half or more of the 54 utilities now using the technique adopted it to (1) create equity in salary administration, (2) improve salary administration, (3) standardize salary administration, (4) provide definite, systematic, and factual data for determining the relative worth of jobs, and (5) establish a basis for placement and promotion.

The personnel director is the key man. In most of the utilities now reporting formal programs, he was the individual who proposed investigating the advantages of job evaluation. Company presidents have shown enthusiasm, actively promoting adoption of a program. Formal approval by top management—the president, executive committee, or board of directors—has been required in all but one company.

How Everyone Was Informed

Next comes the task of informing supervisors of the objectives and techniques of the program. Most popular means of transmitting this information have been staff meetings; departmental groups meetings; conferences with individual staff members; and letters or memoranda from either the president, director of personnel, or general manager.

Non-supervisory employees were told of the proposed program through a number of media. Most used means of communication, in order of their popularity, have been by direct word from supervisors; by word from union representatives; through group meetings; by articles in employee publications; by letter from the president, personnel director, or general manager; in conferences with employee leaders; through individual employee conferences; and through special bulletins.

In striving to acquaint both the supervisor and workers with the objectives and techniques of job evaluation, the personal approach was stressed. The advantages of the program to management and worker alike were emphasized, and the "why" as well as the "how" was explained.

Procedure for installing a job evaluation program is pretty well set, with little room for variation. Once the program is introduced to employees, a rating plan adopted, and administrative policies established, actual work begins. Utilities reporting in the survey disclosed this typical sequence: job facts secured, job descriptions written, jobs rated and classified, pay rates determined, and finally these rates established.

Management representatives played the dominant role in the installation of job evaluation in the utility field. Either they were charged with the entire responsibility or worked with management consulting firms. The first method was slightly more popular. Only 3.8% of the companies having programs relied exclusively on management consultants.

Main reasons given by utilities for relying on their own men to install the programs were: well qualified, knew the organization better than an outsider, reduced suspicion toward plan, participation aided in securing acceptance and understanding, helped train employees for maintenance of plan.

Where employees and consultants both participated, reasons for the choice were: knowledge of the organization combined with technical skill allowed employee participation but maintained an objective point of view and required less time than if employees worked alone. Where con-

sultants alone were responsible for installing a program, the reasons cited were: specialists in work, saved time, and had more objective viewpoint.

A majority of the utilities using the job evaluation technique assigned the overall direction and coordination of the plan to one person—generally the director of personnel. His principal responsibilities are to establish installation procedures, to maintain and administer the program, and to select personnel to carry it out.

The six factors considered most frequently by the utility companies in rating jobs were: (1) responsibility, (2) knowledge, (3) effort and skill, (4) physical conditions, (5) personal and social conditions, (6) supervision. Some companies measured several different aspects of a primary factor. For instance, among the subfactors under "responsibility" considered by one or more companies were these: safety, funds and property, confidential information, accuracy, equipment and materials, costs, seriousness of errors, work of others, waste, and dependability. The other primary factors on which ratings were based had a similar number of subfactors.

The Boss Wasn't Evaluated

The range of jobs covered by the utility plants in their evaluation programs has, in the majority of cases, included all jobs below that of department head. Some included the department head, a few top executive positions, but these trends were not significant.

Many utilities reported they used more than one procedure for collecting information about job duties. Three most popular methods were (1) interviewing supervisors of the jobs, (2) interviewing employees on the job, and (3) having the job descriptions written by the department heads or supervisors.

Personnel department was most frequently responsible for securing the job facts, usually through the use of a job analyst, but practices varied widely among utilities. Final job descriptions were usually prepared by the same person or group who secured the job facts. Less than one-third of the firms followed the recommended practice of having both employees and supervisors approve the final job descriptions. The major trend was to seek the approval of supervisors only.

Management consultants and representatives of the personnel department were the two groups generally having the responsibility for training those who were to secure job facts. Training methods most frequently used were: (1) studied job evaluation literature, (2) learned procedures for getting job facts, (3) prepared sample job descriptions which were criticized, and (4) learned principles of interviewing.

Most popular system for rating job values among utilities is called the "point method". This consists of choosing factors common to the jobs to be evaluated and determining the number of degrees to be allocated to each factor. Both the factors and the degrees must be strictly defined. The factors are then weighed, and point values are assigned to each degree of each factor. This system offers a graphic and descriptive type rating scale considered by many authorities to be more reliable and valid than any other device. If strictly adhered to, it is less easy to manipulate than other systems.

Next in popularity among utilities were the "grading" and the "factor-comparison" methods. The "grade" method involves a predetermined scale composed of definitive levels of work requirements. Against this scale, a job rater can measure a job description and select the one grade which can be most closely identified with the duties, responsibilitties, and requirements of the job. "Factor-comparison" method usually consists of choosing five factors inherent in the key jobs to be rated. The degree of each factor present in a single job is assigned a monetary value and the rating is thus derived.

The "ranking" method, used by one of the 54 utilities reporting in the survey, consists of ranking jobs in terms of their differences in levels of duties, responsibilities, and requirements. Jobs are considered as a whole, rather than analyzed by factors.

Type of rating plan was most often chosen by a management consultant firm, but personnel departments had a voice in the selection. Predominant reasons for choosing a particular system were: (1) better suited to company needs, (2) recommended by management consultants, and (3) used by other companies in the field. It was more usual to have a single individual rather than a committee design the rating scale.

Once the job descriptions were in hand and a rating system developed, the actual rating was more frequently done by a committee than by a single individual. Job raters, whether participating in committee action or doing the job alone, were trained by use of job evaluation literature, studying the rating system chosen, learning rating procedures, and by rating sample job descriptions. After being rated the jobs were grouped into classes, ranging most frequently between 5 and 15 different classes.

Plan Explained Personally

Upon completion of the proposed job evaluation programs, those responsible for development usually met with top management to explain the plan and secure final adoption. In slightly less than half of the utilities using job evaluation, top administrators had participated in the installation and were already acquainted with the plan. Individual interviews with various members of top management were held in a number of firms, most often to supplement the information presented at group meetings. Use of descriptive literature and stories in employee publications further supplemented this communication. Similar methods were used to get the story across to non-supervisory employees, with the personal approach emphasized.

The 54 utilities using the job evaluation technique expressed varying degrees of satisfaction with their plans. The rundown:

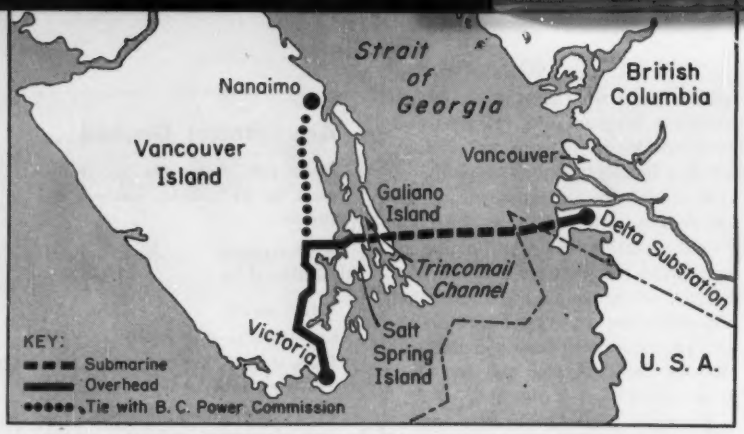
Highly satisfactory.....	29.7%
Satisfactory	64.8%
Fairly satisfactory	5.5%

Advantages Gained...

from job evaluation programs used by 54 utilities covered by survey:

Advantages Realized by	Number of Utilities
Salary equity	50
Consistency, uniformity	50
Factual basis for judging worth of jobs	50
Better promotion, transfer, and placement policies	46
Standardization of salaries	42
Better morale	30
Better control over salary costs	25
Improved organization	25
Reduced employee turnover	8

SUBMARINE CABLE from mainland to Vancouver Island appears as shown



MAP shows the location of the 132-kv cable crossing from the British Columbia mainland to Galiano Island and Salt Spring Island to Vancouver Island terminal

132-Kv Submarine Cable Connects

TRANSMISSION Construction

Ship pays out 16½, 4-mile unspliced sections of 138-kv cable across Strait of Georgia and Trincomail Channel

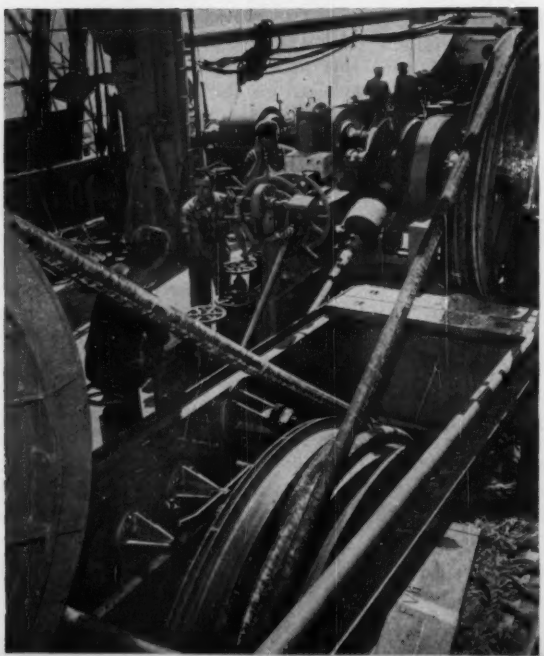
Next week the world's highest-capacity and longest unspliced submarine cable is scheduled to begin delivering power to Vancouver Island from the lower British Columbia mainland.

This 138-kv, gas-pressure cable, consisting of five 4½-in. single-conductor cables, was installed in unspliced lengths of about 16½ and 4 miles. It constitutes a $5-million portion of British Columbia Electric Co's new $8-million, 46-mile, 132-kv transmission system for feeding 120,000 kva across the Strait of Georgia to greater Victoria and Vancouver Island south.

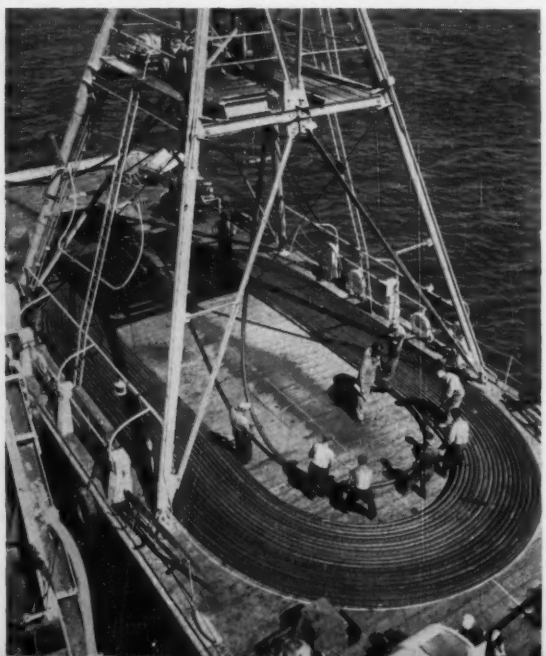
Cable Unmatched Anywhere

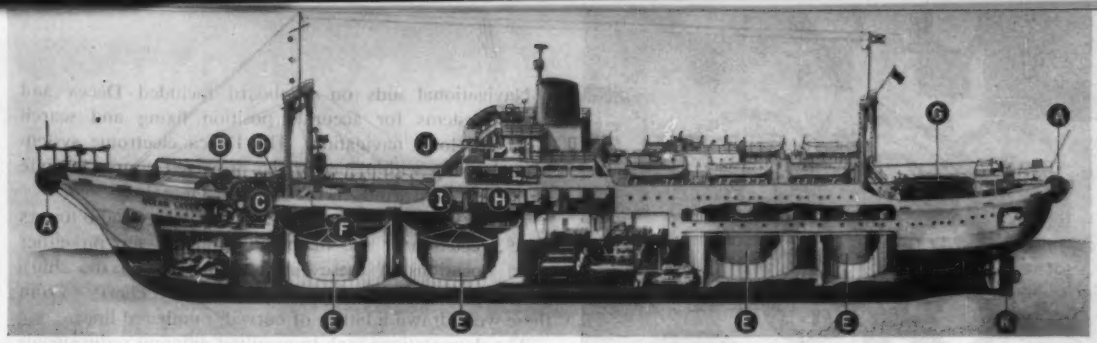
"This area will have a submarine power supply unmatched anywhere in the world. I know of nothing else, planned or built, to come close to its capacity," said T. Ingledow, B.C. Electric vice president and executive engineer, who conceived and developed the plan.

CABLE ENGINE with 9½-ft drum and braking gear draws cable from tanks and passes it to pay-out sheave in bow



SHALLOW-DRAFT BARGE is used to lay cable near and up to shore line where water is too shallow for the cable ship





LEGEND

A—7-ft-dia sheaves
B—Load-cell dynamometers
C—Cable engines with 9½-ft drum and braking gear
D—Draw-off and holding back gear
E—Cable tanks, 76,809 cu ft capacity
F—Crinolines control cable payout
G—Pay-out gear and load-cell dynamometer
H—Air-conditioned test room
I—Drum room for controlling pay-out
J—Decca and Loran gear
K—Active rudder

Vancouver Island and Mainland

The undersea link, acclaimed as "one of the most significant electrical developments in British Columbia," is B.C. Electric's response to load growth accompanying increasing population and industrial expansion on the island. In view of the mainland's undeveloped hydroelectric reserves, steam-electric or nuclear-electric plants would not have been economical.

Three Phase Conductors

When it appeared that load would exceed the island's hydro power resources, B.C. Electric engineers began studying submarine power cable designs. After two years of such research, along with surveys of the bottom of the Georgia Strait, the project was scheduled. British Insulated Callender's Cables, Ltd., accepted the job of designing, building, delivering, and laying the cable.

The Ocean Layer, second largest and best equipped cable-laying ship in the world, was chartered from Submarine Cables, Ltd. From the start, the month-long job of laying the cable was delicate and exacting. Extensive use was made of an electronic navigation system for guiding the ship as it placed five cables along the ocean floor within a 1¼-mile easement at depths of 200 fathoms, or 1,200 ft.

Of these cables, three will serve as phase conductors of the solidly grounded wye system, the other two being spares.

Water Depth Varies

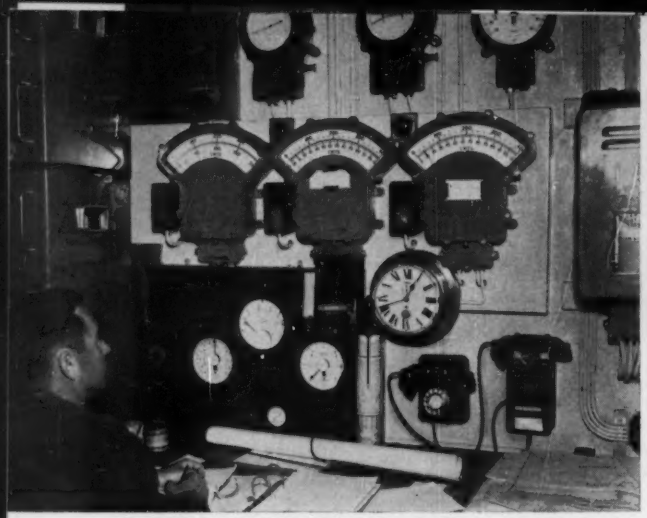
Route of the cable was determined in late 1954 through hydrographic surveys of the floor of the two main waterways to be crossed, the Strait of Georgia and Trincomail Channel. In the strait, most of the route lies below the 100-fathom line, the deepest point at 200 fathoms. In the channel, average depth is about 73 fathoms, the deepest point 105 fathoms. In charting the 3½-mile channel, the survey ship covered 520 miles, recording depth variations at 100-yd intervals.

The cables have their mainland jump-off point at Tsawwassen Beach, near Point Robberts. The tidal flats there were trenched for ¾ mile, and the cable was laid in cast iron pipe to protect it against tidal action. From the beach the cables plunge west under the strait for 16½ miles to Taylor Bay on Galiano Island. The line then crosses the island with ACSR aerial conductor which spans to nearby Parker Island. From there the 4-mile cable lengths carry the line under Trincomail Channel to Salt Spring Island. At these island landings, the cable is laid in concrete chase to below low-water level. Transmission is overhead from Salt Spring Island to Vancouver Island near Duncan, where interconnection is made to the Victoria-Nanaimo network.

The 4,600-ton Ocean Layer arrived at Vancouver in July after a 40-day trip from England with more than 100 miles of cable coiled in her four cable tanks. Ten sections of cable included five 17-mile lengths and five 4-mile lengths. The vessel has a maneuverability on water comparable with that of a helicopter in air. She can move forward, backward, sideways, or maintain a fixed position despite wind or current.

Cable and Crossing Data in Brief

Type of cable	138-kv, gas-pressure, 1/C, 4½ in. overall dia
Conductor	Hollow stranded copper, 0.35 sq in. cross section
Insulation	Oil-impregnated paper
Jackets and armor	Lead jacket Three layers of tinned bronze Rubber covering Stranded galvanized steel armor Waterproof jute wrapping
Number of cables	Four active and one spare
Unspliced lengths	One 16½-mile and one 4-mile per cable
Depths of water	
Strait of Georgia	Average, 100 fathoms Maximum, 200 fathoms
Trincomail Channel	Average, 73 fathoms Maximum, 105 fathoms



SHIPBOARD INSTRUMENTS of Decca electronic system provide the navigator with readings to verify the vessel's course

ANCHOR CHASES are used at the four locations where cables enter or leave the water on both sides of cable crossing

CABLE TUNNEL of reinforced concrete leads cable from the overhead terminal to the jump-off site on the mainland

Navigational aids on shipboard included Decca and Loran systems for accurate position fixing and search radar for local navigation. The Decca electronic system kept the ship within feet of the projected course in spite of currents and winds in the Strait of Georgia.

Here is how the system worked. Temporary radio towers were erected near the mainland jump-off site on either side. Locations of these "slave" stations and the ship's projected course were plotted on master charts. From these were drawn a lattice of curved, numbered lines.

The slave stations each transmitted different radio signals which actuated indicating instruments in the ship's navigating room. As the ship progressed, the navigator kept checking the instruments to see that readings corresponded with lines on the charts. When differences occurred, he altered the ship's course until the instruments agreed with the numbers opposite the charted course.

Tunnel Used on Mainland

Cable was laid into the strait at a speed of about 3½ knots. Each of five runs across the main portion of the channel took about 5 hr.

"As the load grows on Vancouver Island, we shall add more generating units on the mainland and lay more submarine cables," Ingledow said. Eventually, seven cables will be placed in service.

At the mainland jump-off site, the cables enter the water from a 400-ft reinforced concrete tunnel and an anchor chase which slopes down a 200-ft embankment. Concrete anchor chases were built also at the three other places where the cables leave or re-enter the water on the island side of the strait.

Cables are carried in brackets along the walls of the tunnel. A series of stairs along the floor of the tunnel facilitated access for installation crews; maintenance men will use them later. At the tunnel's upper mouth, the cables are linked at a special terminal point to overhead lines from B.C. Electric's new $1.1-million Arnott substation. This station is connected to the company's Delta substation which is tied to the mainland transmission network.

Warns of Gas Leaks

All five cables will be maintained under a constant pressure of 300 psi of nitrogen. The gas is bled from high-pressure bottles through regulators into the cables at four stations, Point Robberts, and Galiano, Parker, and Salt Spring Islands. An electronic alarm system installed by the B.C. Telephone Co will warn of a drop in gas pressure in the event of leakage. The system is interconnected among the four stations where gas is introduced. A drop in pressure will energize a light on the telephone exchange nearest the trouble zone, whereupon B.C. Electric trouble-shooters will be alerted. It is believed to be the first alarm system of its type applied to a gas-pressure cable.

Tests Successful

Emergency pumping equipment at each gas pressure station will start automatically when the pressure drops below 300 psi. The equipment is designed to maintain sufficient gas pressure until repair crews arrive.

Before putting the cables into service, B.C. Electric tested the line at 276 kv dc, twice the operating voltage, for 15 min. As the test was successful, the line will operate at full line voltage.

1956 7th Annual Electrical Industry FORECAST: 1970 Steady Industry Growth

ARY MOSSIMAN, Manager Market Research
ARTHUR J. STEGEMAN, Assistant Editor

It has been said that there's nothing as certain as change. To prove the point this year's forecast is loaded with changes—all of them looking for a bigger, better, and brighter tomorrow.

There are a number of very good reasons for our increasing optimism. Perhaps the first and foremost of these is the fact that in the past we've always missed the mark. But we hasten to add, always fallen short of it. Secondly economists, in general, and the McGraw-Hill Department of Economics (which prepares our "Business Outlook"), in particular, look forward to a much rosier future.

The ever increasing consumer "appetite" for goods and services is half the reason for the rosier outlook. Industry's willingness to provide them through expansion is the other half.

Chiefly because they now better know our economy's enormous potential, McGraw-Hill economists have raised their sights. They have upped their long range outlook for industrial production 18% over last year's prediction. And as a result their estimate of national product has been increased 13%. Thinking on just how much money consumers will have to spend on conveniences (including electrical living) has naturally also climbed.

As a result of this and other statistical expressions of greater optimism, Electrical World's outlook for the electrical industry has risen substantially.

Taken year by year, however, this increased optimism is slight and in many cases insignificant. You'll still find in this a down-to-earth statistical and analytical study of the industry's future.

In This Report . . .

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BUSINESS OUTLOOK

Population, Households, Housing and Consumer Spending

Increasing population will continue to be a powerful driving force in our national economy. By the end of 1956 we will find another 2.8 million new people living among us. In 1957 another 2.8 million will be added. But even these figures, impressive as they are, don't give a true indication of how our population will be growing by 1970. Family formations are currently running at a very low level reflecting the lower birth rate of the depression years. After the mid 60's we can look for a rapidly rising rate of family formations as the products of the post World War II baby boom come of age. And that's sure to spark a new boom in consumer spending.

By 1970 our population will be 212.7 million people—a jump of more than 26% over 1956. To get the complete picture though, keep in mind that by 1970 our population will be increasing at a rate of better than 3.5 million a year.

A rapid rise in the number of households will be another outgrowth of our rising population. In 1970 our population of 212.7 million people will be made up of 69.2 million household units, almost a 40% increase over the present number. To be sure, new marriages will account for most of the new households. But older folks will be responsible for the overall jump. Medical science is seeing to that. These older household units are becoming a larger percentage of all households each year.

The increasing number of households spells out the need for new homes in future years. By 1970 housing starts will be a whopping 1.6 million a year. That will be the minimum required to shelter our rapidly rising population. On top of this you must consider the growing number of homes that are classified as unlivable. Between now and 1970 it's estimated that better than 5 million old homes will have to be replaced. This could push housing starts higher than 1.6 million by then.

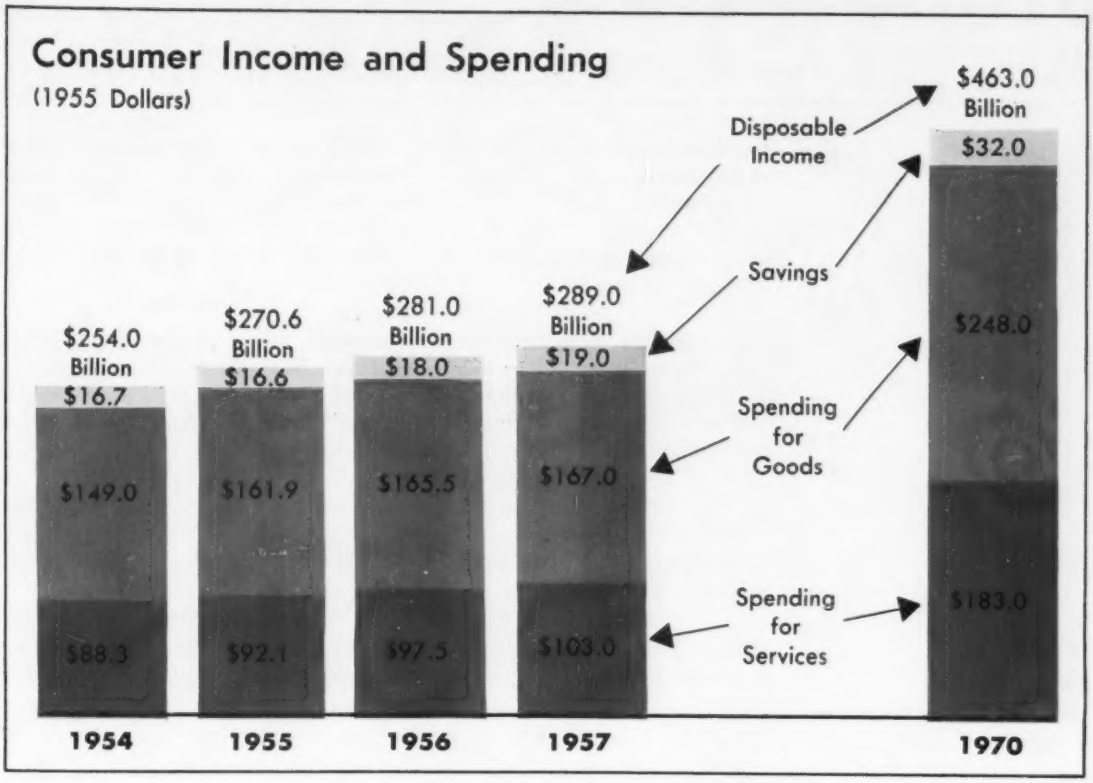
In the immediate future you can expect homebuilding to continue at as high a level as Congressional approval can make it. Experts say that one million non-farm housing completions is below normal. They feel that this figure is a minimum. You can count on builders shooting for a level of 1.2 million new homes each year through 1960.

The current low rate of family formations could hold housing starts to a million in the late 1950's. But there is another factor to consider. It will be quite some time before building catches up to the demand for one family suburban homes large enough for families with two or three children.

Gross National Product (the measure of the overall output of goods and services) will increase 58.8% to $643.3 billion by 1970. Even 1956, "The year of the rolling adjustment", will see a 3.6% jump in GNP over 55's $390.9 billion. Next year will be even better. GNP will gain another 3.7% to reach $420 billion.

Almost 70% or $281 billion of this year's GNP will become the real income of individuals. Next year consumers will have even more to spend—$289 billion or almost 3% more than this year. From now until 1970 consumer disposable income will climb almost 65% to a record $463 billion.

Per capita disposable income will be up 30% by 1970. In that year individuals will have about $2,177 a year to spend at their own discretion. You can't actually predict how people will spend their money in 1970 but you can be pretty sure that a good part of this added income will be spent on items that have been considered luxuries in the past.



The Economic Outlook: More People with More to Spend

	Population	New Nonfarm Dwelling Units	Households	Gross National Product	Consumer Disposable Income
	million	thousand	million	billion 1955 dollars	billion 1955 dollars
1948	146.6	1,000	42.2	295.8	208.9
1949	149.2	900	43.6	294.9	211.9
1950	151.7	1,450	44.4	321.8	229.5
1951	154.4	1,200	45.3	345.4	233.3
1952	157.0	1,100	46.1	357.5	238.8
1953	159.6	1,100	46.7	374.3	250.7
1954	162.4	1,200	47.4	365.4	254.0
1955	165.2	1,360	48.5	390.9	270.6
FORECAST					
1956	168.0	1,150	49.6	405.0	281.0
1957	170.8	1,200	50.8	420.0	289.0
1958	173.6	1,200	52.1	428.0	294.0
1959	176.5	1,200	53.4	444.0	308.0
1960	179.4	1,275	54.7	464.0	325.0
1965	195.3	1,400	61.7	548.0	389.0
1970	212.7	1,600	69.2	643.0	463.0

ELECTRICAL BUSINESS OUTLOOK

Residential Kwhr Sales

Residential customer increases won't set any records in the immediate future. A low rate of family formations will keep a tight ceiling on annual increases for the next few years. From now until 1960 residential customers will increase about 1.2 million a year. At the end of this year electric utilities will have 45.6 million residential customers on the books. Next year they'll have 46.8 million.

Customer additions in 1970 will be quite another story. By then the post World War II baby boom will be increasing household formations at a record rate. Residential customer additions will also feel a new surge. In 1970 about 1.4 million will be added to give the nation's utilities a total of 63.8 million residential customers—36% more than 1957.

Increases in consumer disposable income will be a bigger factor in boosting residential sales than customer increases in future years. With per capita disposable income up 30% by 1970 ($2,177 a year) we can look forward to increasing consumer expenditures on comforts and conveniences.

"Electric living" will be closer to a fact by 1970 than it is now. Air conditioning, electric heating, and electric cooking are today's luxuries that will be a necessity tomorrow. And don't forget, people will have the means to buy them. Add to this the many new electrical products that will be introduced between now and '70, and you begin to see the vast potential in energy sales to residential customers.

Average annual residential use of electricity will increase more than 8.8% this year to 2,995 kwhr per customer. In 1957 it will climb to 3,258 kwhr per year. Increases in both years will reflect the use of more electric appliances.

But in 1970 the average residential customer will use 8,070 kwhr per year to run his "electric" home—almost 170% more than this year. And don't think this figure is unreasonable. In just the past decade average residential use has increased more than 106%. Since 1940 it has jumped almost 190%.

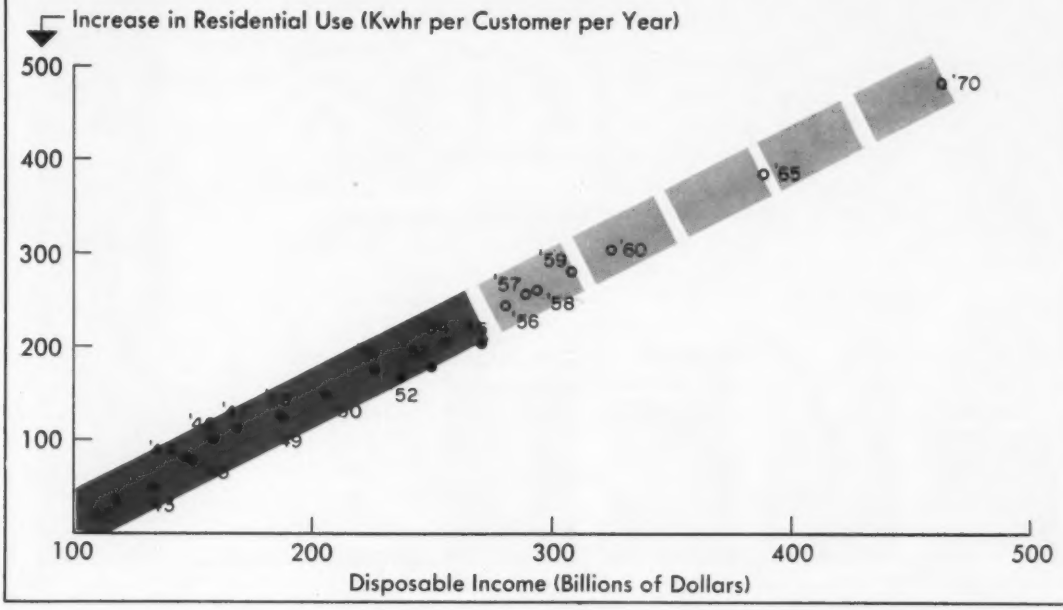
Residential sales naturally will reflect the increases in customers and their average use. In '56 residential sales will increase almost 12% to 134.8 billion kwhr. Next year the increase will be slightly less, bringing sales up to 150.5 billion kwhr. But by 1970 next year's sales will more than triple in reaching a total of 510 billion kwhr a year.

The cost of electricity to residential customers will continue to go down. Increased total sales and further technical advances in generating facilities will see to that. This year residential customers will pay an average of 2.6¢ per kwhr for their electricity—1.5% less than last year. By 1970 the cost will drop another 11.5% to 2.3¢ per kwhr.

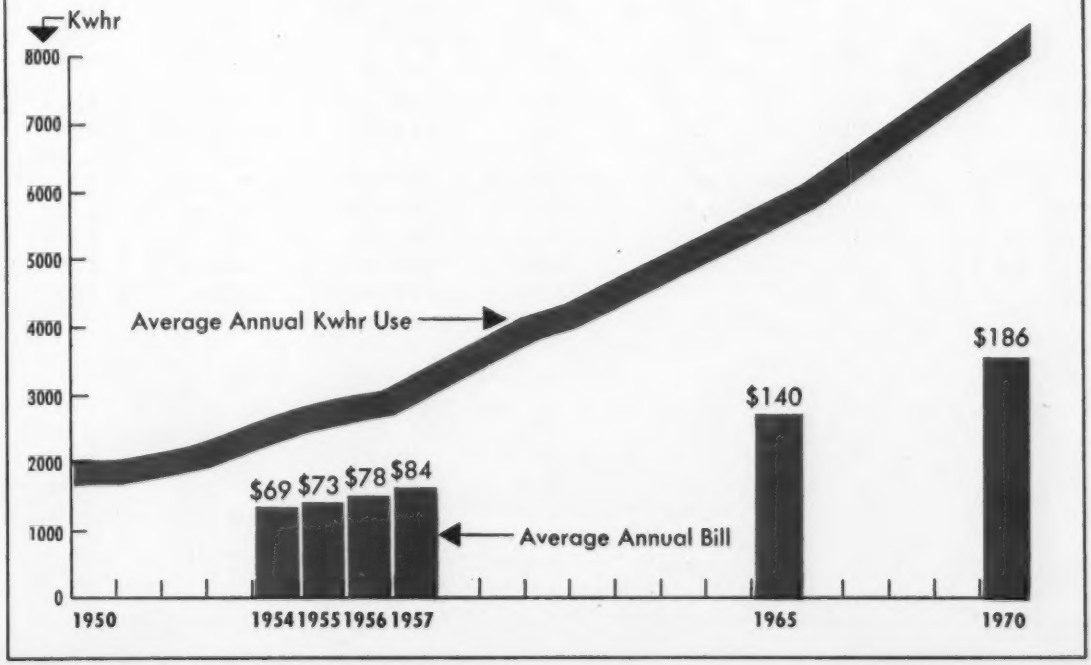
Average annual residential electric bills will be up though. That will come from increased average use mentioned above. The average bill in '70 will be almost $186 per year—138% higher than this year's $78. But even then it will only cost the customer about 8.5% of his per capita disposable income compared with almost 5% this year.

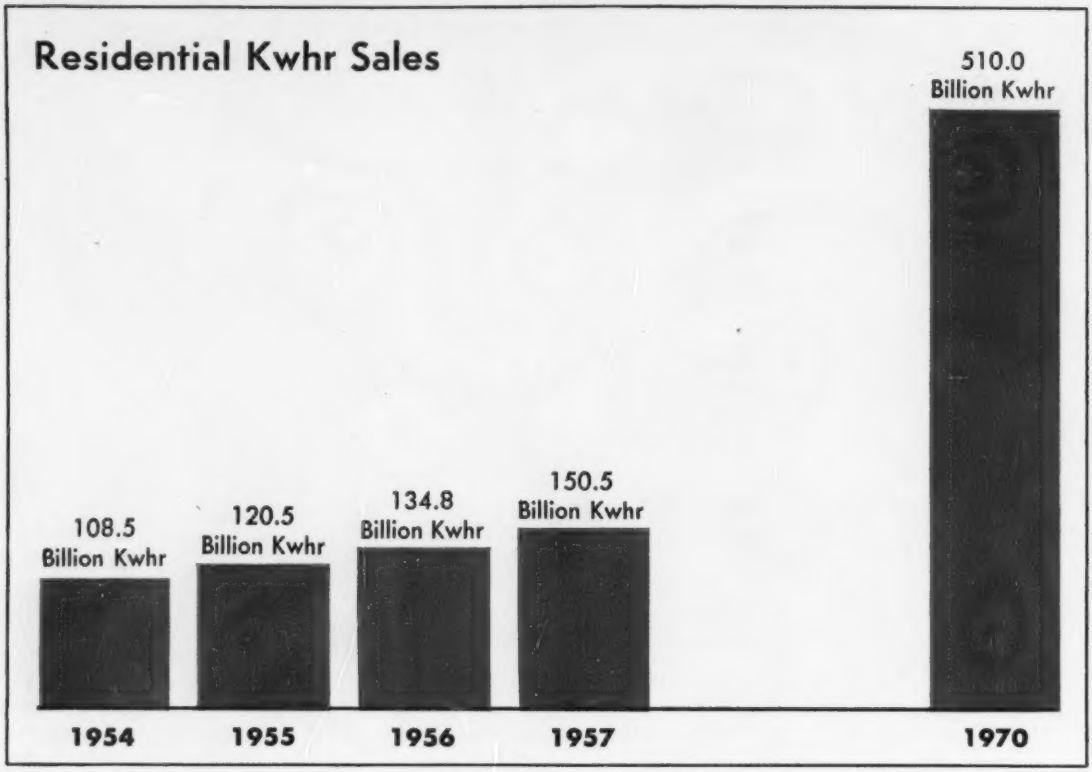
Utility revenues from residential electric service will hit $11.7 billion in 1970— a jump of more than 200% over next year's $3.9 billion. This year electric revenues will increase around 9% to $3.5 billion.

More Income Ups Appliance Purchases, Increasing Average Residential Kwhr Use



Residential Average Use & Bill





Ahead: Residential Use of Over 8,000 Kwhr by 1970

	Customers	Use per Customer	Revenue per kwhr	Average Annual Bill	Sales	Revenue
	millions	kwhr	cents		billion kwhr	million dollars
1948	33.5	1,563	3.01	$47.05	51.0	1,533
1949	35.4	1,684	2.95	$49.68	58.1	1,717
1950	37.5	1,830	2.88	$52.70	67.0	1,932
1951	39.2	2,004	2.81	$56.31	77.0	2,165
1952	40.7	2,169	2.77	$60.08	86.8	2,401
1953	42.0	2,346	2.74	$64.28	97.1	2,659
1954	43.1	2,549	2.69	$68.57	108.5	2,920
1955	44.4	2,751	2.64	$72.63	120.5	3,187
FORECAST						
1956	45.6	2,995	2.60	$77.87	134.8	3,504
1957	46.8	3,258	2.57	$83.73	150.5	3,868
1958	48.0	3,534	2.54	$89.76	167.5	4,255
1959	49.2	3,824	2.51	$95.98	185.8	4,665
1960	50.4	4,126	2.48	$102.32	205.5	5,096
1965	56.9	5,870	2.38	$139.71	330.5	7,866
1970	63.8	8,070	2.30	$185.60	510.0	11,730

BUSINESS OUTLOOK

Industrial Production

Industrial production will increase nearly 70% between now and 1970. That's the kind of increase it's going to take to increase our total output of goods and services (GNP) the nearly 60% our expanding economy will demand. Remember, by 1970 we'll have 45 million more people to feed, clothe, etc.

But many of the same people who will gobble up our increased national product will also help to produce it. As population grows, the labor force will grow too—only not quite so fast. Between now and 1970 we can expect to see a gain of 17 million people in our work force, bringing it to nearly 80 million.

On the other hand, we will be working fewer hours a week. The average work week will probably drop from today's level of 39 hours to 35 by 1970. This means that although we will have 27% more people working in 1970, the number of manhours available will increase only 14%.

Here's what this means in terms of production. In 1955, 63.1 million workers, on the job 38.9 hours a week, 52 weeks a year, produced $390.9 billion of national product. That's $3.06 of national product for each manhour worked. In 1970, 79.8 million workers will have to produce $643 billion of GNP. To do this in a 35-hour week, they will have to produce $4.43 of goods and services each and every manhour.

Key factor in our economic growth then will be our ability to increase our output per manhour. Increasing our output per manhour to the level we'll need in 1970 will call for a productivity increase of 2½% a year. Good years have seen gains of over 3%. Improvements in our technology already possible can easily raise productivity the necessary 2½% a year.

Greatly increasing production in the face of a slow rise in men and manhours spells automation and plenty of it. Far from becoming a problem our guess is that it is an absolute necessity. That is if we are to increase our standard of living in the face of increasing population. In the long run, if our total output of goods and services (GNP) is going to increase nearly 60%, industrial production will have to increase approximately 70%. During 1956 industrial production increased 2% from 1955's 139 level (1947-49 average = 100) to a record 142. In 1957 it is expected to increase another 5% to 149.

Chief element of industrial production is factory output—manufacturing production. Last year it stood at 141, or 41% greater than the average during 1947, 1948 and 1949. This year it will increase 1.4% to 143. In 1957 it will rise another 6.3% to 152. By 1970 manufacturing production will be 248 or 73% higher than today's level. That's the increase it will take to boost industrial production 70% and gross national product approximately 60%.

And, as a final thought here's a new look at our month by month industrial production forecast for regular readers of our business outlook page.

Industrial Production (1947–49 = 100)

1956	July	126–128	1957	Jan.	145–147
	Aug.	135–137		Feb.	147–149
	Sept.	139–141		Mar.	148–150
	Oct.	145–147		April	148–150
	Nov.	145–147		May	146–148
	Dec.	143–145		June	148–150

ELECTRICAL BUSINESS OUTLOOK

Industrial Kwhr Sales

Industry will use more kwhr per manhour in future years. That's already in the cards. You can see that in the fast moving trend towards automation. This means that by 1970 the average worker will use 18 kwhr per manhour—120% more than the 8¼ kwhr he uses today.

Automation will make our limited labor supply stretch further. It will mean that each unit of manufacturing production will need less labor—but more electricity. By 1970 only 117 million manhours will be needed for each point of manufacturing production—40% less than today. But it will take 120% more electric energy per manhour to cut manhours this amount. In the final analysis this means factory production will jump 73% by 1970 with only a 4% increase in the number of manhours.

Labor productivity in manufacturing will register gains of about 4% a year from now until 1970—thanks to electricity. Where a billion manhours today provides 5.2 points of the manufacturing production index, in 1970 the same amount of labor will provide 8½ points. Today it takes 1,597 million kwhr to produce the goods representing each point of the manufacturing production index. In 1970 it will take 2,110 million kwhr—or 32% more energy per point.

Increased use of electric energy by manufacturers per unit of production coupled with increasing production each year spells out substantial increases in the manufacturing use of electric energy. This year manufacturing use will increase over 4.5% to reach 228.4 billion kwhr. Next year it will hit 248.2 billion kwhr—an 8.7% gain.

By 1970, with kwhr use per point of production up 32% and the volume of production up 75%, use by manufacturing should rise to 523.4 billion kwhr—129% greater than it is today.

Electric energy used in aluminum and magnesium production will jump 115% to 69.4 billion kwhr a year by 1970. In 1956 these industries will require 32.2 billion kwhr to produce 1.7 million tons of aluminum and 78 thousand tons of magnesium. By 1970 aluminum production should pass 3.3 million tons, and magnesium should be at the 500-thousand-ton level.

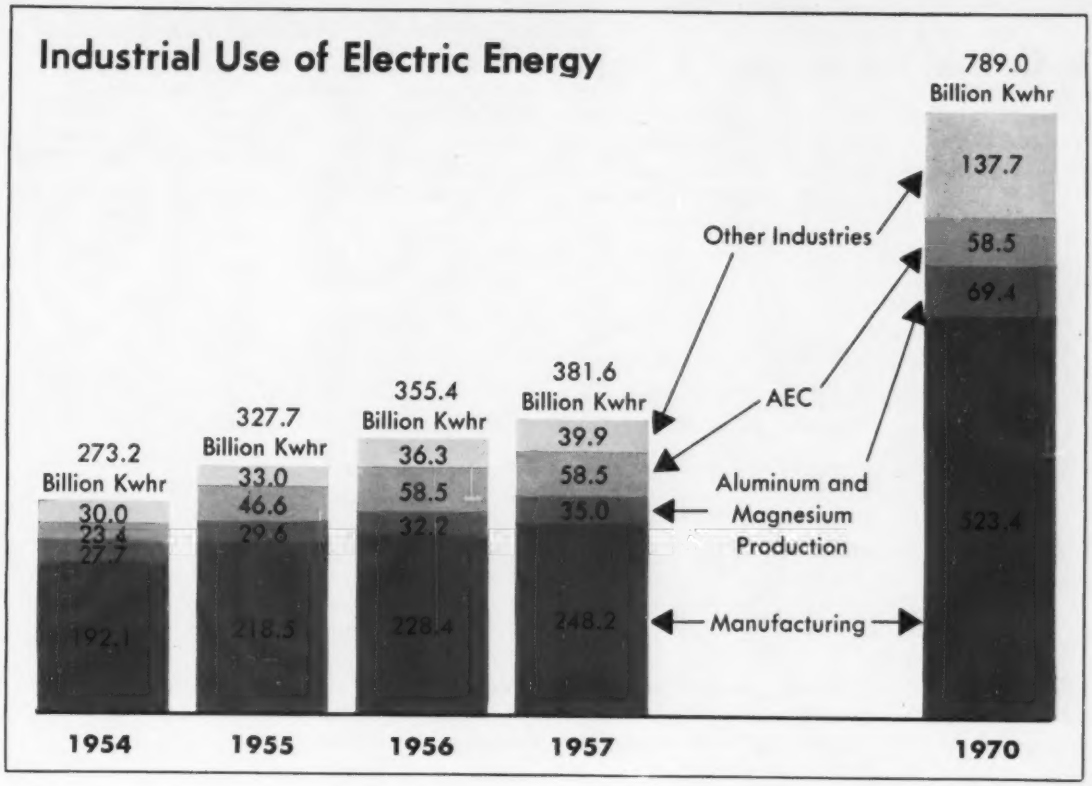
Use of energy by Atomic Energy Commission installations has been increasing at a startling rate since 1952. Last year the AEC used 46.6 billion kwhr. This year that's up to 58.5 billion kwhr or 16½% of all the energy used by industry. But that appears to be the end of the line as far as increased use by AEC.

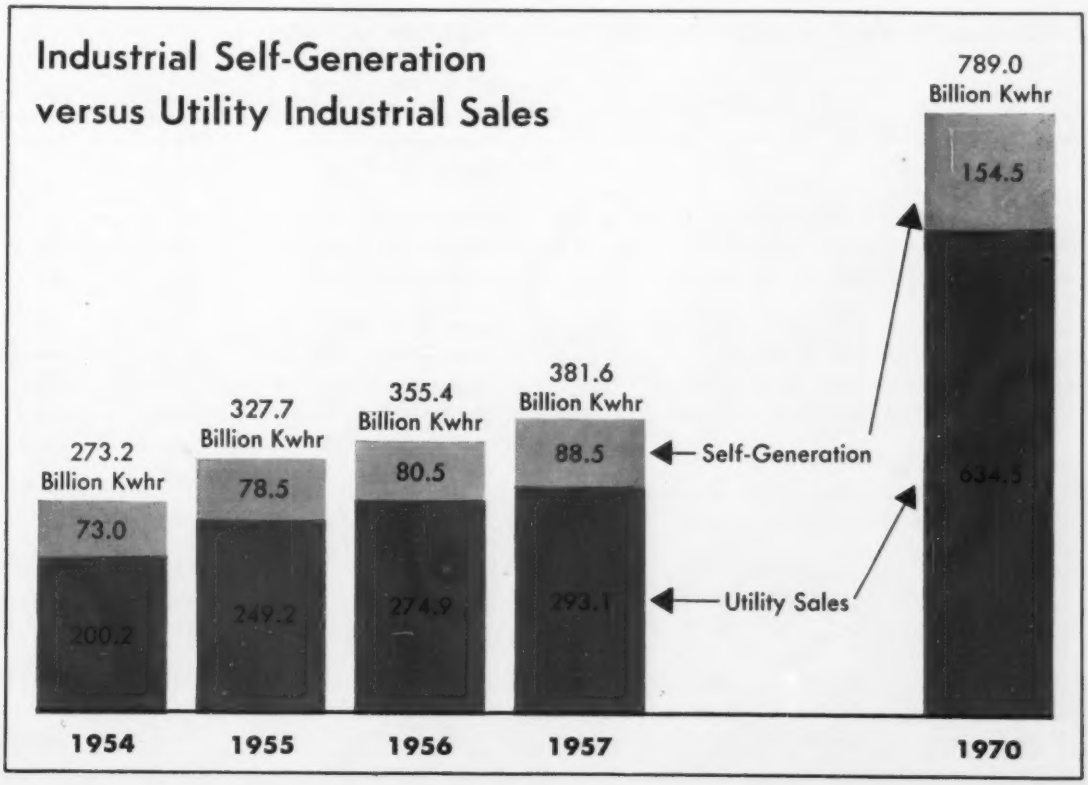
To the use by manufacturing and the AEC must be added the use by other industries such as mining, petroleum, and government manufacturing. This series also includes office buildings and department stores.

That brings total use of electric energy by industry to 789.0 billion kwhr by 1970. That's 122% more than the 355.4 billion kwhr industry will use this year. During 1957 industrial use will rise to 381.6 billion kwhr.

Primary source of this power will continue to be the industrial or "large light and power sales" of electric utilities. These will amount to 274.9 billion kwhr in 1956, or 10.2% more than in 1955. During 1957 we will see a 6.5% rise to 293.1 billion kwhr.

Utility industrial sales will more than double by 1970 to reach 634.5 billion kwhr. By then, generation by industry for its own use will have fallen from this year's 22.6% of total needs to 19.6%—or 154.5 billion kwhr.


Industrial Use of Electric Energy
789.0 Billion Kwhr
137.7
58.5
69.4
523.4
Other Industries
AEC
Aluminum and Magnesium Production
Manufacturing
381.6 Billion Kwhr
39.9
58.5
35.0
248.2
355.4 Billion Kwhr
36.3
58.5
32.2
228.4
327.7 Billion Kwhr
33.0
46.6
29.6
218.5
273.2 Billion Kwhr
30.0
23.4
27.7
192.1
1954
1955
1956
1957
1970


Industrial Self-Generation versus Utility Industrial Sales
789.0 Billion Kwhr
154.5
634.5
Self-Generation
Utility Sales
381.6 Billion Kwhr
88.5
293.1
355.4 Billion Kwhr
80.5
274.9
327.7 Billion Kwhr
78.5
249.2
273.2 Billion Kwhr
73.0
200.2
1954
1955
1956
1957
1970

Industrial Production: A Fight to Keep Up With Demand

	Industrial Production	Manufacturing Production	Manufacturing Manhours	Primary Aluminum Production	Primary Magnesium Production
	1947–49 = 100	1947–49 = 100	million	thousand tons	thousand tons
1948	**104**	**103**	**26,006**	**623**	**10**
1949	**97**	**97**	**23,122**	**603**	**12**
1950	**112**	**113**	**25,337**	**719**	**16**
1951	**120**	**121**	**27,268**	**837**	**41**
1952	**124**	**125**	**27,287**	**937**	**106**
1953	**134**	**136**	**28,614**	**1,252**	**93**
1954	**125**	**127**	**25,987**	**1,461**	**70**
1955	**139**	**141**	**27,720**	**1,565**	**70**
FORECAST					
1956	142	143	27,660	1,700	78
1957	149	152	27,660	1,850	86
1958	152	155	27,640	1,950	90
1959	160	163	27,610	2,075	100
1960	167	171	27,500	2,200	125
1965	200	206	28,270	2,750	250
1970	240	248	28,890	3,300	500

Expansion Will Double Utility Industrial Sales

	Manufacturing Use	Aluminum and Magnesium	AEC Use	Other Industries	Total Industrial Use	Generation by Industrial Plants	Utility Industrial Sales
				billion kwhr			
1948	**144.6**	**11.4**	**2.3**	**19.9**	**178.2**	**54.1**	**124.1**
1949	**139.7**	**11.1**	**2.2**	**21.7**	**174.7**	**54.0**	**120.8**
1950	**157.9**	**13.3**	**2.5**	**24.9**	**198.6**	**59.5**	**139.1**
1951	**174.8**	**15.8**	**3.7**	**26.2**	**220.5**	**62.7**	**157.8**
1952	**177.7**	**18.7**	**6.7**	**28.1**	**231.2**	**63.8**	**167.4**
1953	**195.3**	**24.3**	**12.5**	**29.4**	**261.5**	**71.5**	**190.0**
1954	**192.1**	**27.7**	**23.4**	**30.0**	**273.2**	**73.0**	**200.2**
1955	**218.5**	**29.6**	**46.6**	**33.0**	**327.7**	**78.5**	**249.2**
FORECAST							
1956	228.4	32.2	58.5	36.3	355.4	80.5	274.9
1957	248.2	35.0	58.5	39.9	381.6	88.5	293.1
1958	258.4	36.9	58.5	43.9	397.7	92.0	305.7
1959	277.7	39.3	58.5	48.3	423.8	96.5	327.3
1960	297.7	42.1	58.5	53.1	451.4	103.2	348.2
1965	394.4	54.5	58.5	85.5	592.9	126.4	466.5
1970	523.4	69.4	58.5	137.7	789.0	154.5	634.5

ELECTRICAL BUSINESS OUTLOOK

Commercial, Other, and Total Kwhr Sales

Steady increases in commercial customers will be another outgrowth of our rising population and increased production. More people will mean more office buildings, more restaurants and more retail stores of all kinds to serve our growing consumer market. With population becoming less centralized there will be more retail establishments to serve these customers promptly.

Use of electric energy by the average commercial or "small light and power" customer already reflects the trend towards more electrical "assistants" in retail establishments and office buildings. Next year the average commercial customer will use 15,218 kwhr—more than twice what he used at the end of World War II. That's 956 kwhr more than this year, and 1,796 kwhr more than last year. Between 1957 and 1970 average commercial use will increase 132% to hit 35,361 kwhr a year.

Annual commercial energy sales will rise to 291 billion kwhr in 1970—registering an increase of better than 200% over next year's sales of 96.4 billion kwhr.

"Other" sales by the nation's electric utilities will increase about 3.8% in 1957 to nearly 33 billion kwhr. This will come on top of a 3.3% increase this year. Biggest gains will come from increased use by rural customers and a rising community interest in more and greatly improved street lighting.

The nation's $33 billion highway construction program is also sure to stir interest in street lighting. This will be our nation's largest non-defense expenditure. Not enough is as yet known about exactly where and how this money is to be spent. One thing is certain, however, any move toward improving highway safety by lighting more than just major interchanges will prove our long range estimate extremely conservative.

Total sales by the nation's electric utilities will increase about 8% in 1957 to 573 billion kwhr. And this will come on top of a 10% increase this year when total sales are expected to hit 530 billion kwhr. By 1970 electric utilities will realize total annual sales of almost 1,486 billion kwhr—an increase of 160% over next year. That sounds like quite a jump. But remember: In the last ten years total sales have risen more than 152%.

Residential kwhr sales will continue to become a more important share of total sales. Having slipped to 15% during World War II, they now account for fully one quarter. This forecast looks forward to their reading well over a third.

That's at the expense of "industrial's" share of the total. These have only held their own at 50% during the past few years despite the rapid increase of AEC use. Now you can expect them to slip to 40% of the total by 1970. AEC's use of electric energy is, incidentally, singularly significant. It accounts for 10% of today's energy sales.

And, as a final thought here's a new look at our month by month utility kwhr sales forecast seen regularly on our Electrical Business Outlook page.

Total Sales—Billions of Kwhr

1956	July	42.7	**1957**	Jan.	48.7
	Aug.	45.3		Feb.	45.9
	Sept.	44.5		Mar.	46.3
	Oct.	44.9		April	46.3
	Nov.	45.1		May	46.0
	Dec.	46.2		June	45.6

For the Average Commercial Customer—35,361 Kwhr by 1970

	Commercial Customers	Average Annual Use per Customer	Commercial Sales	Rural Sales	Street & Highway Lighting Sales	Other Public Authority Sales	Railway & Railroad Sales	Interdepartmental Sales
	thousand	kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr	billion kwhr
1948	5,132	8,535	43.2	6.3	2.5	6.3	6.7	0.7
1949	5,291	8,871	46.3	7.4	2.7	6.6	6.1	0.6
1950	5,466	9,320	50.4	7.4	3.0	7.2	5.9	0.6
1951	5,528	10,432	57.3	8.5	3.3	8.0	5.8	0.5
1952	5,634	11,106	62.1	8.5	3.5	8.4	5.4	0.5
1953	5,863	12,007	69.2	9.6	3.8	9.0	5.0	0.6
1954	5,992	12,353	73.4	10.2	4.0	9.4	4.7	0.6
1955	6,042	13,422	80.8	10.8	4.4	10.2	4.6	0.6
FORECAST								
1956	6,204	14,262	88.5	11.3	4.7	10.5	4.5	0.6
1957	6,333	15,218	96.4	11.8	4.9	10.9	4.5	0.6
1958	6,460	16,238	104.9	12.3	5.2	11.1	4.5	0.6
1959	6,586	17,326	114.1	12.8	5.5	11.5	4.5	0.6
1960	6,711	18,487	124.1	13.3	5.7	11.8	4.5	0.6
1965	7,438	25,569	190.2	16.5	7.0	14.4	4.5	0.6
1970	8,232	35,361	291.1	19.5	9.0	16.9	4.5	0.6

Total Utility Sales Will Hit 1¼ Trillion Kwhr in 1970

	Residential		Industrial		Commercial		"Other"		Total
	billion kwhr								
	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales
1948	51.0	21.2	124.1	51.6	43.2	17.9	22.5	9.3	240.7
1949	58.1	23.4	120.8	48.6	46.3	18.6	23.4	9.4	248.5
1950	67.0	23.9	139.1	49.5	50.4	18.0	24.0	8.6	280.5
1951	77.0	24.2	157.8	49.6	57.3	18.0	26.0	8.2	318.2
1952	86.8	25.3	167.4	48.9	62.1	18.1	26.3	7.7	342.5
1953	97.0	25.2	190.0	49.5	69.2	18.0	28.0	7.3	384.2
1954	108.5	26.4	200.2	48.7	73.4	17.9	28.9	7.0	410.9
1955	120.5	25.1	249.2	51.8	80.8	16.8	30.4	6.3	480.9
FORECAST									
1956	134.8	25.5	274.9	51.9	88.5	16.7	31.4	5.9	529.6
1957	150.5	26.3	293.1	51.2	96.4	16.8	32.6	5.7	572.6
1958	167.5	27.4	305.7	50.0	104.9	17.1	33.6	5.5	611.7
1959	185.8	28.1	327.3	49.4	114.1	17.2	34.8	5.3	662.0
1960	205.5	28.8	348.2	48.8	124.1	17.4	35.8	5.0	713.6
1965	330.5	32.1	466.5	45.3	190.2	18.5	42.9	4.2	1,030.1
1970	510.0	34.3	634.5	42.7	291.1	19.6	50.4	3.4	1,486.0

ELECTRICAL BUSINESS OUTLOOK

Peak Loads, Capability and Utility Spending

Electric energy output will show increases corresponding to increases in kwhr sales. In '57 the nation's major electric utility systems (called class I) will have to produce 650 billion kwhr—8% more than the 600 billion kwhr that will be produced this year and 19% more than '55's total production. In 1970 electric energy production will jump 162% over next year's figure and hit a record 1,700 billion kwhr.

These are our forecasts based on the latest business outlook. But how do they compare with other forecasts? You can get some idea from a comparison with the Edison Electric Institute's 19th semi-annual electric power survey published last April.

Electric Energy Output—Billions Kwhr

	EEI	Electrical World
1955	546.3	
1956	602.0 up 10.2%	600.3 up 9.9%
1957	645.3 up 7.2%	649.7 up 8.2%
1958	693.7 up 7.5%	694.7 up 6.9%
1959	739.3 up 6.6%	752.5 up 8.3%

Peak loads on class I systems will increase to 115.4 million kw in 1957. That's an 8.2% increase over this year's peak of 106.7 million kw and a rise of 17.6% over last year. By 1970 we will see winter peaks of around 295 million kw—177% higher than this year's. Here's how EW's peak loads compare with EEI's latest survey.

Peak Loads—Millions of Kw

	EEI	Electrical World
1955	98.1	
1956	105.8 up 7.8%	106.7 up 8.8%
1957	114.1 up 7.8%	115.4 up 8.2%
1958	122.3 up 7.2%	123.2 up 6.8%
1959	130.4 up 6.6%	133.4 up 8.3%

Summer peak loads are also climbing. In some regions hot weather peaks are already matching or exceeding the following December's peak. The trend to higher summer peaks will continue although in most regions these are not expected to exceed the winter peak. However, as the summer peaks climb the problem of maintenance and repair on generating equipment will become more acute. To offset this problem our guess is that gross margins will be maintained as close to 22% over the winter peak as utilities can manage. But it will take till 1960 to reach this level.

Capacity additions will be at a fairly low level over the next few years. In '56 they will drop from a record 12.9 million kw last year to 6.4 million kw. You can chalk this up to delays in planning and delays in construction schedules caused by strikes and material shortages. Next year additions will rebound to 9.6 million kw.

You can't compare these capacity additions with EEI's April figures. That's because the Westinghouse strike lasted longer than had been expected when EEI made its estimate. Estimates of industry observers since the end of the strike indicate its effects may hold additions to as low as 6.0 million kw this year.

Generating capability of the nation's power system will grow to 130.8 million kw by the end of 1957 as compared to 116.3 million kw at the end of last year. By the end of '56 capability will stand at 122.0 million kw. This means gross margins are headed down both in '56 and '57. This is where the delays in capacity

additions will have their effect. In 1956 gross margins will drop to 14.4%. Next year they will go even lower to 13.3%.

By 1970 the country's generating capability will stand at 360.3 million kw—an increase of 175% over 1957. That's what it will take to provide a 22% margin at a peak load of 295.3 million kw.

Retirements of older generating units will play a bigger part in capacity additions every year. In 1970 units will be retired at a rate of better than 2 million kw a year. Between 1956 and 1970 a total of 19.9 million kw will be retired. This will bring total retirements since 1946 to 22.6 million kw—around 66% of the total generating capacity installed at the end of 1935.

Generating capacity additions will be at a record rate of 26.8 million kw a year in 1970. On the surface this appears to be quite a jump over last year's forecast of 17.6 million kw a year. Of course, the basic reason is that the general economic outlook is much brighter. This means a brighter outlook for the electrical industry. And don't forget almost six million of this will be needed just to maintain a 22% margin over that year's peak. And better than 2 million kw will be built to replace units that will be retired.

Conventional fuel burning plants will still account for the bulk of capacity additions by 1970. In that year capacity additions will break down this way: 23.3 million kw of conventional steam plants; 2.4 million kw of nuclear capacity and 1.1 million kw of hydro. Here's how additions will look in future years.

Capacity Additions—Thousands of Kw

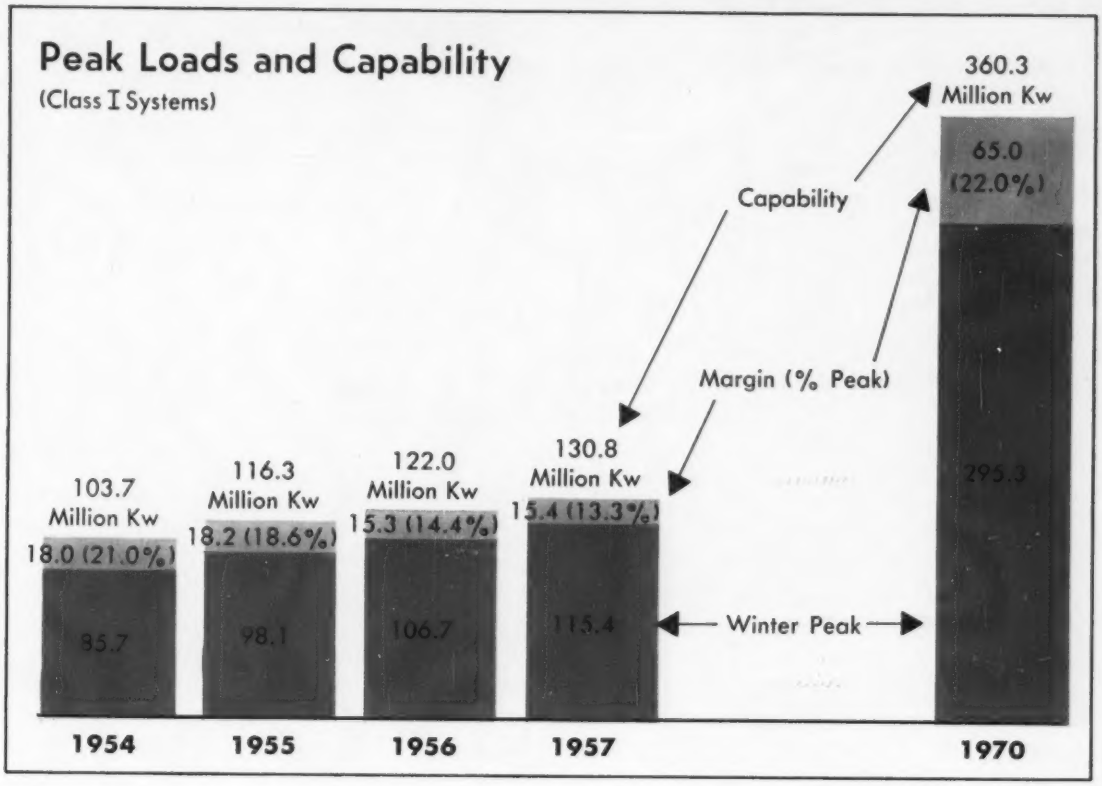
	Conventional Steam	Nuclear	Hydro	Total
1956	5,456	0	971	6,427
1957	8,216	73	1,272	9,561
1958	12,138	75	1,928	14,141
1959	15,354	346	1,100	16,800
1960	15,000	389	1,100	16,489
1965	16,733	1,000	1,100	18,833
1970	23,308	2,400	1,100	26,808

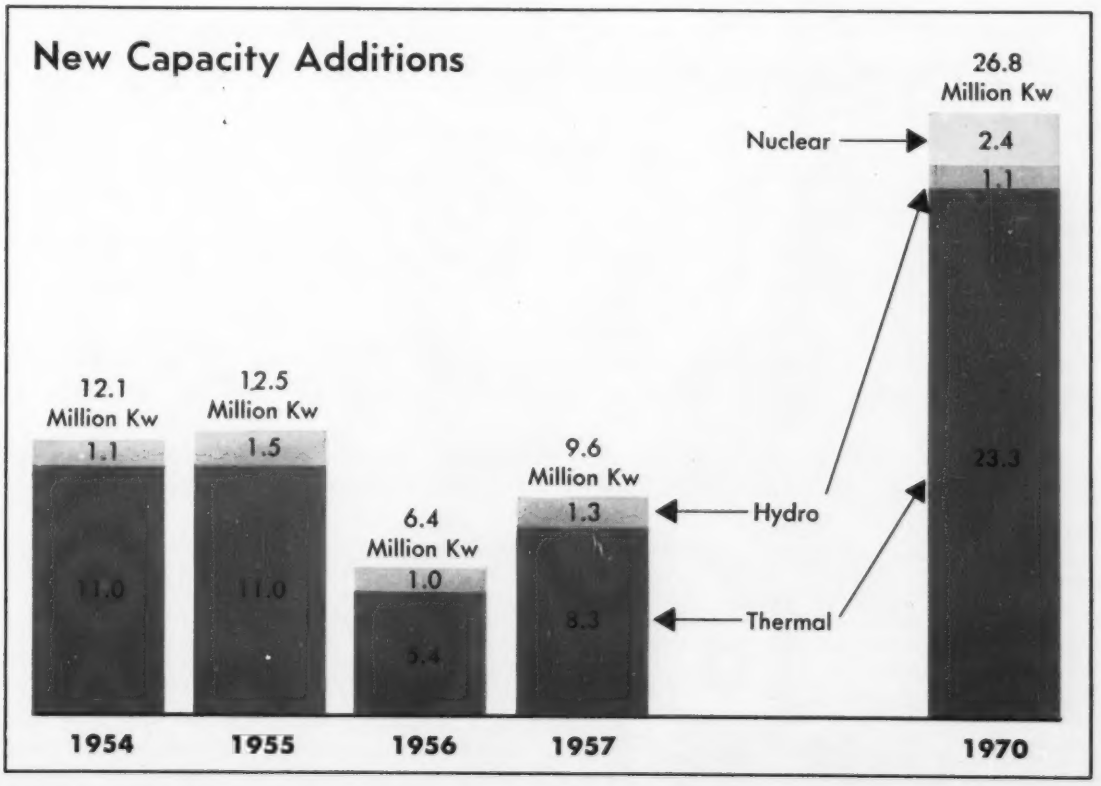
More than $1.8 billion will be spent on new generating facilities next year. This will be an increase of 20% over this year's expenditure which will drop back to $1.5 billion. Both years, of course, reflect the low level of capacity additions in these years. Generation expenditures will show a healthy growth each year from now on. By 1970 they will be over $4.2 billion a year.

Steady increases in residential and commercial kwhr sales and customers will push distribution expenditures up an average of 8.5% a year through 1970. This year these expenditures will hit $1.5 billion—8.7% higher than last year. In 1957 they will climb to $1.6 billion. In 1970 the total will be $4.5 billion.

Transmission budgets are also going up in line with the increases in generation and distribution budgets. Next year transmission expenditures will rise to $708 million. This will be an increase of better than 14% over this years budget of $619 million. By 1970 transmission expenditures will be up to almost $1.9 billion a year—more than 2½ times what will be spent on these facilities in 1957.

Total electric utility expenditures will register a 14.5% gain next year to hit $4.3 billion. Keep in mind though that this gain is from the slightly under $3.8 billion budget of this year. This is only a 4.4% gain over 1955. In both cases ('56 & '57) percent gains are influenced by the schedule of capacity additions. Total utility spending (in terms of today's dollars) in 1970 will be over $11 billion a year—a 160% increase over next year's budgets.


Peak Loads and Capability
(Class I Systems)
360.3
Million Kw
65.0
(22.0%)
Capability
Margin (% Peak)
103.7
Million Kw
18.0 (21.0%)
85.7
116.3
Million Kw
18.2 (18.6%)
98.1
122.0
Million Kw
15.3 (14.4%)
106.7
130.8
Million Kw
15.4 (13.3%)
115.4
Winter Peak
295.3
1954
1955
1956
1957
1970


New Capacity Additions
26.8
Million Kw
Nuclear
2.4
1.1
12.1
Million Kw
1.1
11.0
12.5
Million Kw
1.5
11.0
6.4
Million Kw
1.0
5.4
9.6
Million Kw
1.3
8.3
Hydro
Thermal
23.3
1954
1955
1956
1957
1970

Rising Peak Loads Will Triple Capability by 1970

	Output	Winter Non-Coincident Peak Load	Load Factor	Capability	Gross Margin
	billion kwhr	million kw	%	million kw	% Peak
1948	277.0	51.1	61.9	54.4	6.6
1949	287.7	54.0	60.8	61.7	14.2
1950	328.6	62.0	60.9	68.4	10.3
1951	370.8	68.1	62.1	76.2	11.8
1952	398.3	72.8	62.2	81.5	11.9
1953	441.2	78.4	64.2	92.4	17.8
1954	471.9	85.7	62.8	103.7	21.0
1955	546.3	98.1	63.6	116.3	18.6
FORECAST					
1956	600.3	106.7	64.2	122.0	14.4
1957	649.7	115.4	64.3	130.8	13.3
1958	694.7	123.2	64.4	144.0	16.9
1959	752.5	133.4	64.4	159.9	19.9
1960	811.9	143.7	64.5	175.3	22.0
1965	1,175.8	206.3	65.1	251.7	22.0
1970	1,700.1	295.3	65.7	360.3	22.0

Data in this table is for Class I Systems. These operate about 97% of the nation's generating capacity. All other data (kwhr sales, capital spending etc.) is industry-wide.

Capital Spending Will Triple—Top $11 Billion

	Generation	Transmission	Distribution	Miscellaneous	Total
			million dollars		
1948	1,103	400	1,075	84	2,662
1949	1,410	400	1,190	93	3,093
1950	1,275	425	1,127	109	2,936
1951	1,344	504	1,089	131	3,068
1952	1,925	577	1,118	118	3,738
1953	2,088	647	1,200	127	4,062
1954	1,939	666	1,288	122	4,015
1955	1,547	571	1,343	161	3,622
FORECAST					
1956	1,493	619	1,460	210	3,782
1957	1,834	708	1,584	203	4,329
1958	2,227	809	1,719	220	4,975
1959	2,344	864	1,865	239	5,312
1960	2,428	919	2,024	259	5,630
1965	2,944	1,261	3,045	390	7,640
1970	4,237	1,865	4,580	586	11,268

CONTROL EFFICIENCY and flexibility are typified by this modern control room at the Potomac River Station. Controls are set up for five turbine-generator units. Left to right: Potomac Electric Power Company's Steam Production Superintendent, W. J. Robinson; Electrical Engineer, D. F. Hughes; and Chief Operator, E. A. Howard, discuss panel arrangement.

PEPCO's 5th General Electric unit at Potomac Station helps meet area's growth

Estimates of the population increase in the Potomac Electric Power Company's service area show a 20% rise since 1950. This was the third highest rate of growth among the 15 metropolitan areas with a population of over one million in the United States. And, growth in the Washington area has given every indication of continuing.

Pepco's System Planning Division has an unusual record of accurate forecasts, and has matched its prediction with balanced expansion programs. Pepco has spent over $100,000,000 since 1950 on construction and expansion. This five-year construction and expansion program reached a high point in 1956 with the delivery of a third 90/100,000-kw General Electric turbine-generator. By specifying General Electric equipment, Pepco and its consultants, Stone and Webster, benefited from General Electric power plant services . . . saving time, money and manpower.

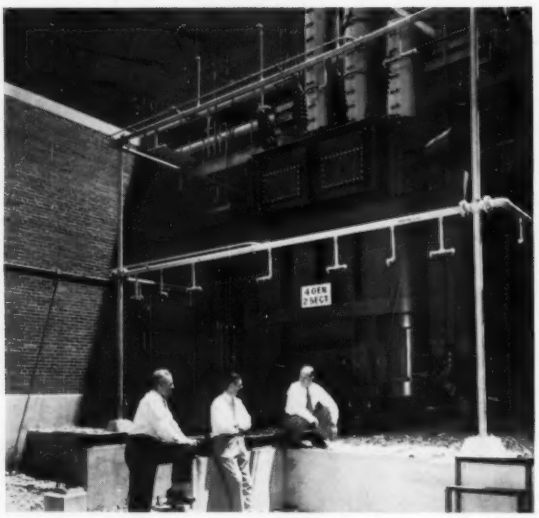
FOR MORE DATA TURN PAGE ▶

GENERAL ELECTRIC

POWER PLANT SERVICES REPORT

INCREASED CAPACITY for growing load will be provided when unit no. 5 is installed early next year at Potomac River. Unit 5, as well as units 3 and 4 (the one shown here), is 90/100,000-kw reheat turbine-generator with steam conditions of 1800 psig, 1050 F/1000 F. Shown above are L. W. Cadwallader, Pepco Mechanical Engineer; H. J. Sykes, Vice President, Stone & Webster; and W. J. Robinson, Potomac Electric's Superintendent of Steam Production.

PEPCO'S latest 90/100,000-kw G-E unit

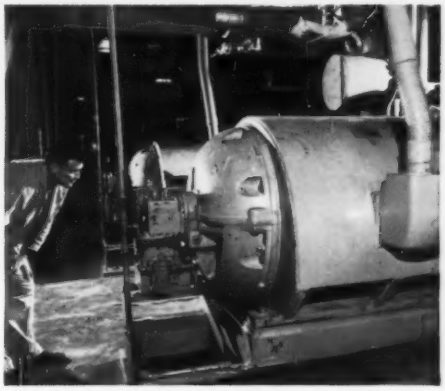


LOWERED INSTALLATION COSTS and on-time delivery of vital equipment like this G-E 90,000-kva power transformer are assured by General Electric power plant services. Another of these units will be installed by Potomac Electric Power Company shortly at the Potomac River Station.

SERVING SUBMARINE CABLE carrying power under Potomac River to Washington, D.C., are these General Electric 69-kv, 2,500,000-kva oil circuit breakers. Discussing switchyard layout are Potomac Electric Power Company's D. F. Hughes, Stone & Webster's H. I. Stewart, G.E.'s F. B. Crider.

PLANNING INSTALLATION of unit no. 5 is a joint endeavor. Here, H. J. Sykes, Vice President, Stone & Webster; D. F. Hughes, Electrical Engineer, Pepco; H. I. Stewart, Construction Superintendent, Stone & Webster; L. W. Cadwallader, Mechanical Engineer and George Bisset, Senior Vice President, Pepco; F. B. Crider, Sales Engineer, G.E., discuss new equipment.

MORE EFFICIENT OPERATION is achieved by General Electric integrated turbine supervisory panel examined here by F. B. Crider, G.E., and L. W. Cadwallader, Pepco Mechanical Engineer.



ASSURANCE AGAINST OUTAGE is provided by 3 boiler feed pump motors per 80,000-kw nameplate rated unit. Pepco Steam Operator L. D. Noland inspects General Electric 800-hp motors.

will boost Potomac River Station capacity 26%

General Electric Power Plant Services help Pepco and Stone & Webster realize lower first costs, higher operating efficiency

Long-range planning at Pepco plays a vital part in determining what steps should be taken to accommodate future growth. The units now in operation at the Potomac River Station are the result of such planning. In 1949-50, two General Electric 80,000-kw nameplate-rated units were installed. By March, 1956, two more of 90/100,000 kw each were operating. Early next year, the fifth General Electric unit at Potomac River will go on the line, bringing the total capacity of the five General Electric units to a nameplate rating of 430,000 kw.

General Electric engineers worked closely with Pepco and Stone & Webster to integrate the design and installation of equipment for optimum station operating efficiency. The same co-ordinated effort will hasten start-up time on unit no. 5 and help keep installation costs to a minimum.

Such application engineering on new equipment is just one of the many power plant services at work on your job when you or your consultants order General Electric apparatus. Product development engineering, field service engineering, and project coordination also help to:

Simplify ordering of equipment purchased either directly or through your consulting engineers, or through a machinery manufacturer.

Conserve engineering time by assisting with electrical equipment details, thereby freeing you and your consulting engineers for other urgent problems.

Integrate equipment design with consultant's plant design to assure the maximum flexibility and effectiveness of operation.

Speed construction by scheduling the arrival and disposition of equipment for maximum installation efficiency and on-time start-up.

Assist in training operators to better understand the full operating capabilities of the equipment.

For details, contact your General Electric Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y. 302-13

GENERAL ELECTRIC

POWER PLANT SERVICES REPORT

INCREASED RELIABILITY of steam turbine-generators is achieved through improved insulations such as Micapal, which has improved dielectric properties, thermal conductivity and tensile strength. This is typical of G.E.'s continuing research in all types of apparatus for the utility industry.

REDUCED FUEL and man-hour requirements have been made possible with G.E.'s new Automatic Dispatching System, a load frequency control system providing immediate and continuous meeting of load, permitting most economic generation by loading all units to equal incremental costs.

New General Electric product developments help utilities lower operating costs

A multitude of products of wide variety are constantly in development in General Electric's laboratories. Two such advances that have recently emerged from laboratory to useful application are the fully automatic load dispatcher and Micapal insulation. Both these products give excellent promise of lowering utilities' operating costs.

Tireless programs of research, development and product improvement are always under way at General Electric. These programs encompass work on turbine-generators, switchgear, transformers, motors, controls, instruments and other electrical apparatus vital to power plant operation. The goal of this work is to provide the electric utilities with practical means of overcoming rising system costs.

RECORD EXPANSION INVESTMENT

How far will this program go? The answer is dramatically illustrated by the fact that General Electric's record $165 million investment earmarked for expansion of laboratory and manufacturing facilities during 1956 is well on the road to fulfillment.

TEAMWORK IN PLANNING STAGES

As the trends in power station equipment continue to require higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, compounded with time-saving, money-saving benefits of General Electric engineering teamwork, offers electric utilities a striking example of why it pays to call in General Electric early in your planning.

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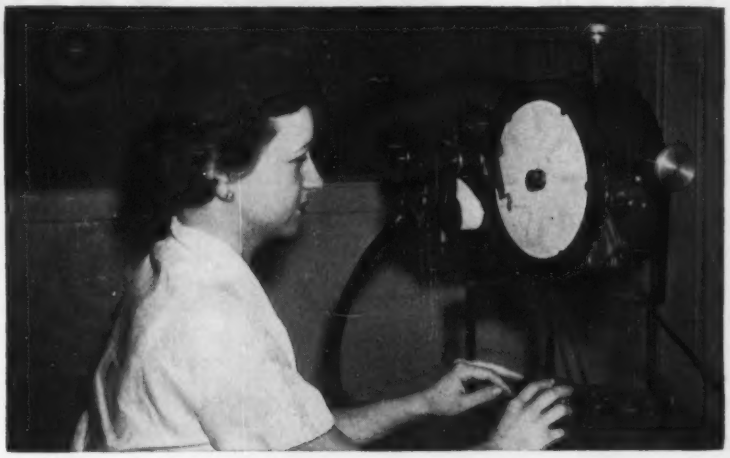
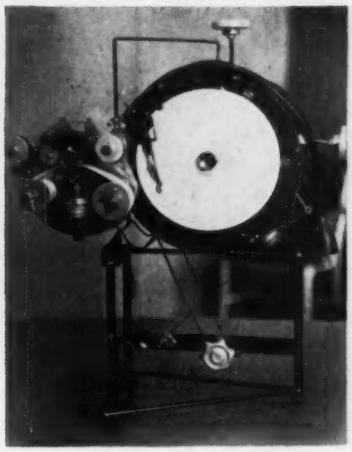
MORE POWER TO AMERICA

GENERAL ELECTRIC

METERING—Design





Speeds Demand Meter Chart Analysis

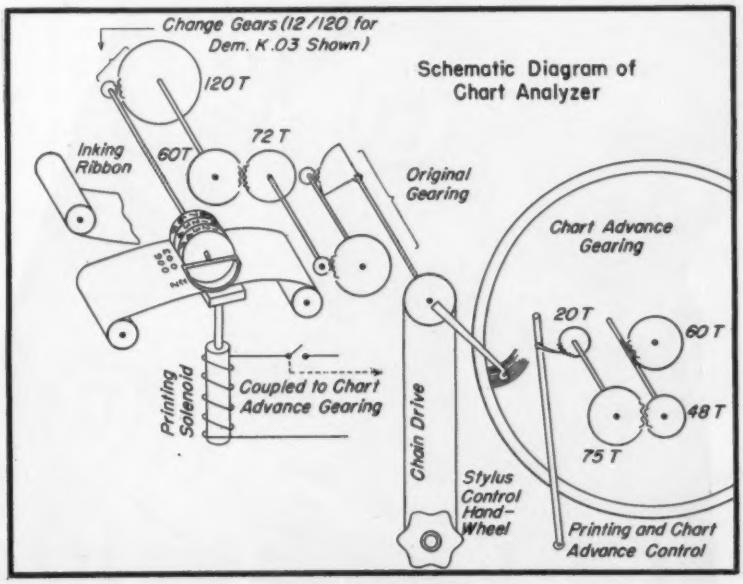
WILLIAM COTTER, Service Engineer, Metering & Underground Dept., Cleveland Electric Illuminating Co, Cleveland, Ohio

A special device, built in the meter laboratory of the Cleveland Electric Illuminating Co, expedites the analysis of demand meter charts. The compiling of load factor data from such charts is a tedious and time consuming operation when the charts are analyzed by visual inspection.

The CEI device consists of the basic parts of a demand meter coupled with those of a printometer, a combination permitting the direct printing of the numerical values of each demand peak on the paper tape of the printometer. The operation of this chart reading converter is as follows:

1. The wax chart is placed on the demand meter frame and carefully aligned so that the curvature of the recorded lines coincides with the curvature described by the stylus. Alignment is accomplished by adjusting the two large knobs at the top and right side of the meter case.

2. The demand meter stylus point has been replaced with a disc containing a viewing slot. The leading edge of the viewing slot is placed over the peak of the demand line to be recorded. Movement of the stylus is effected by turning the chain-driven knob below the case.



Kw Demand Read Directly

3. The type wheels on the printometer are gear driven from the demand stylus shaft so that any deflection of the stylus arm is accompanied by a proportional change in the type wheel settings. Two gears in the gear train can be readily changed to maintain direct kw demand readings with the several chart multiplying constants in common use.

4. The kwd (kw demand) of the recorded line is printed on the printometer paper tape by operating the print control lever below the case. This lever controls the print solenoid and advances the demand meter chart to place the next recorded line under the viewing slot.

(*Continued on page* 174)

DISTRIBUTION TRANSFORMERS

THIS BOLT

COULD SAVE YOU...$3,000

Estimate your possible savings in terms of all transformers on your lines

When the neutral terminal on a 25-kva transformer broke, it put 240 volts across the 120-volt lines of several customers of a Northwestern utility. Result? Nine irate customers sued the utility for about $3000 worth of ruined household appliances.

This was an unusual situation, of course. But ordinary terminals sometimes crack, and the results can be serious. The usual villain is stress-corrosion, initiated when a lineman tightens the terminal clamp close to the metal's yield point. Corrosive elements go to work and eventually the terminal clamp breaks, dropping the line and bringing customer complaints.

G-E Strenicor terminal clamps can save you that expense. Designed to be 100% resistant to stress-corrosion, the clamps are practically immune to failure. Forged from a new copper-nickel-silicon alloy—Strenicor—G-E clamps have a tensile strength of 107,000 psi, and will resist corrosive atmospheres that cause failure in ordinary copper alloys.

Look at the other money-saving features that prove "all transformers are not alike": **Impulse testing,** for instance, saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable Nitrile rubber gaskets help save units from contamination. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-37, Schenectady 5, N. Y.

dollar-saving features prove ATANA*

***ALL TRANSFORMERS ARE NOT ALIKE**
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

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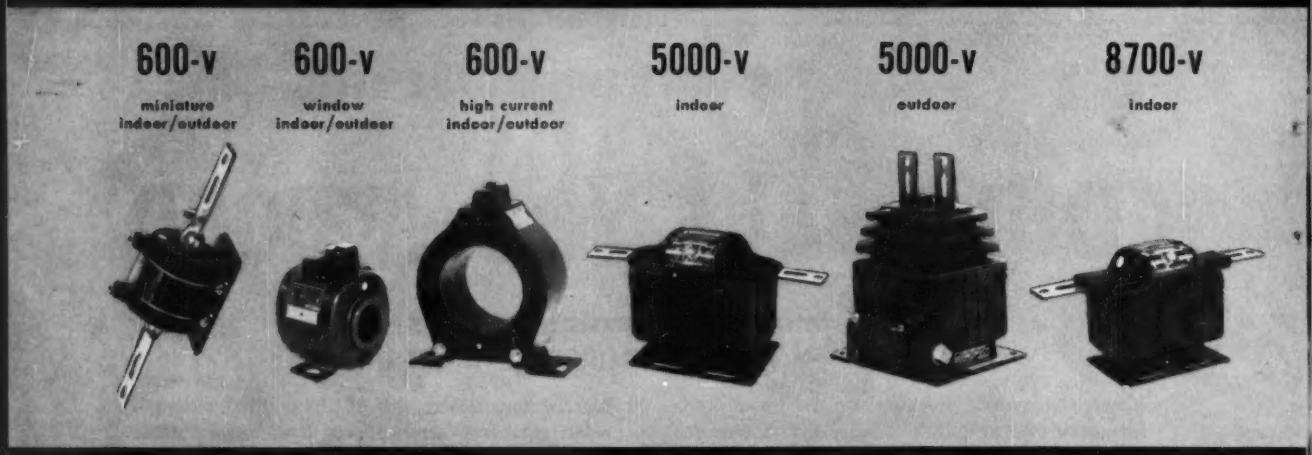
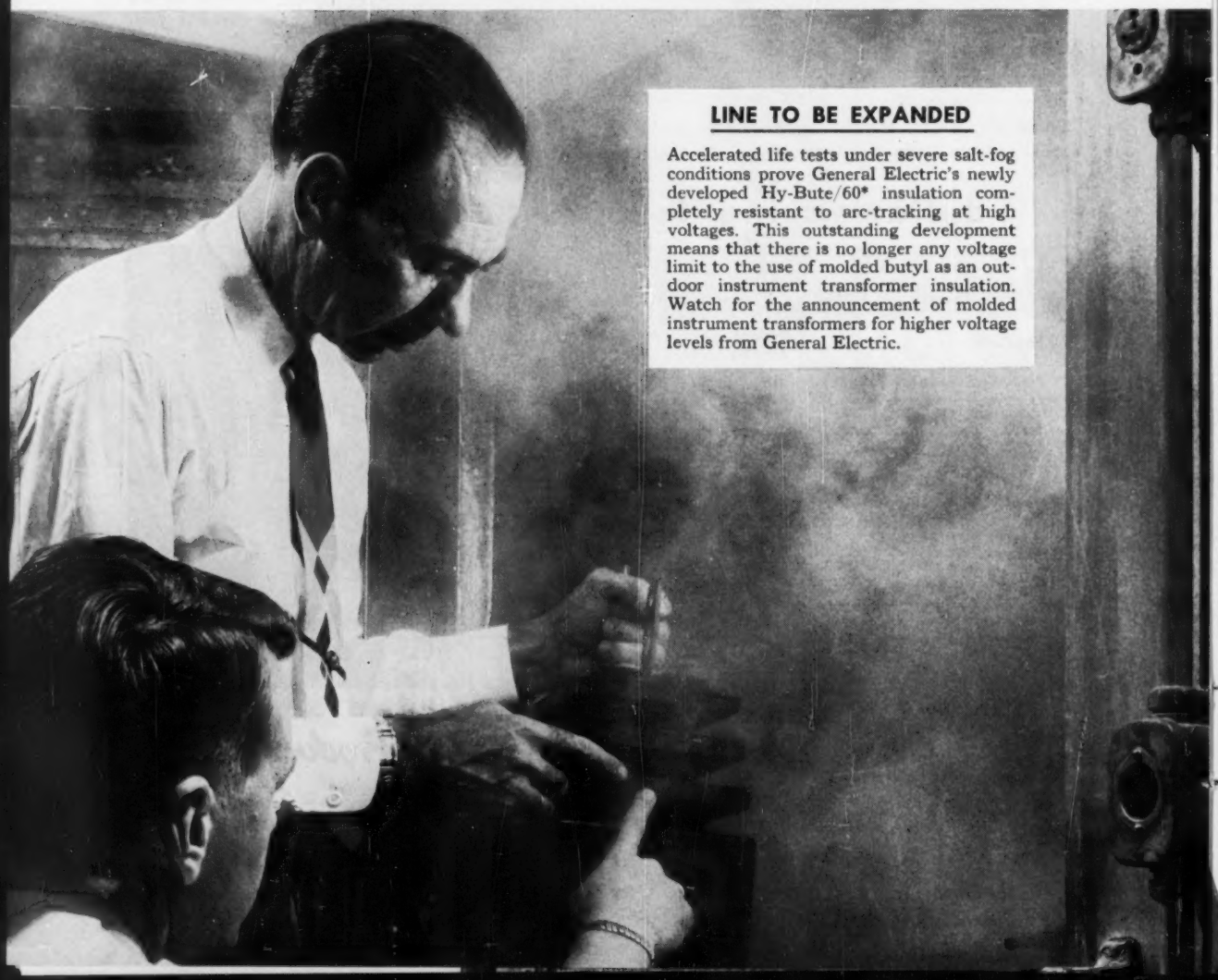


NOW You Get Benefits of Butyl- General Electric



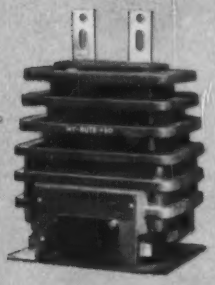
LINE TO BE EXPANDED

Accelerated life tests under severe salt-fog conditions prove General Electric's newly developed Hy-Bute/60* insulation completely resistant to arc-tracking at high voltages. This outstanding development means that there is no longer any voltage limit to the use of molded butyl as an outdoor instrument transformer insulation. Watch for the announcement of molded instrument transformers for higher voltage levels from General Electric.

8700-v
outdoor

15000-v
indoor

15000-v
outdoor



COMPARISON CHART

G-E	X	X	X	X	X	X	X	X	X
MFR-A	X			X					
MFR-B		X	X						

Now General Electric offers molded instrument transformers in a complete line from 600 volts through 15,000 volts.

Molded Construction in all these Instrument Transformers

New 8700-volt indoor and new 8700-volt outdoor current transformers make line complete from 600-v through 15-kv

Molded in Butyl or new Hy-Bute/60* insulation, these nine General Electric instrument transformers give you many cost-saving benefits.

Maintenance is sharply reduced because butyl is corrosion resistant. There are no metal tanks to rust out—no painting is ever required no matter how corrosive the atmosphere. Porcelain bushings, which can break during installation or operation, have been completely eliminated and continuous thermal ratings of 150% to 200% on many models minimize the need for replacing transformers with higher ratings as loads increase.

Stock needs are reduced because many of the new butyl designs replace several older types. The 600-volt butyl types provide greater application flexibility because they can be used either indoors or outdoors. You save money too, since each new butyl-molded design is priced the same as the least expensive of the older models it replaces.

Easier Installation results from the smaller size and lighter weight of butyl-molded transformers. In addition, they can be mounted in any position.

Safer and more reliable operation is assured because flame-resistant butyl will not support fire. Design features such as increased creepage distance add to the dependability of this complete family of molded instrument transformers.

Only General Electric brings you all the advantages of butyl-molded construction in a complete line of indoor and outdoor current transformers from 600-v through 15-kv. For details, call your General Electric Apparatus Sales Representative or request bulletin number GED-3112 from Section 581-3, General Electric Company, Schenectady 5, New York.

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Speeds Chart Analysis

(*Continued from page* 169)

5. The remainder of the chart lines are recorded by repeating steps 2 to 4 inclusive until the chart is completed. With experience, an operator can record the 672 lines on an 7-day, 15-min-interval chart in approximately 30 min.

At present, the printometer charts are sent to a machine accounting office where the demand information is transferred to punch cards. To simplify this work further, explorations are being made into the possibilities of coupling the chart reading converter directly to an accounting machine, thus eliminating the operation of transferring demand data from the paper tapes to the punch cards.

SUBSTATION—Construction

Pre-Fab Control Buildings Extended Cheaper

E. C. RANKIN, Supervising Station Engineer, Appalachian Electric Power Co, Roanoke, Va.

Prefabricated metal control buildings can be extended after completion to provide necessary storage space at a cost below the customary one for making such an extension.

This company's first few extensions involved removal of an entire end of the original structure and re-erection of this part as the end of the extension. New wall and roof panels were used. This conversion was expensive, as the original wall boards and insulation had been installed and in many structures equipment had been fastened to the walls. Moreover the control room had to be opened to weather temporarily. It was desirable to avoid these difficulties and also to separate the new storage section from the original operating room.

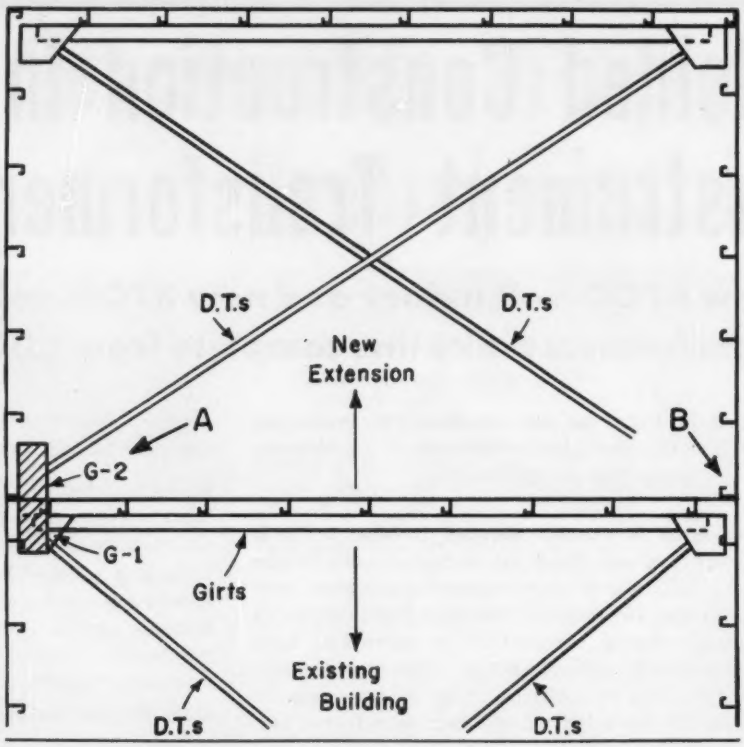
Only Gable Panel Moved

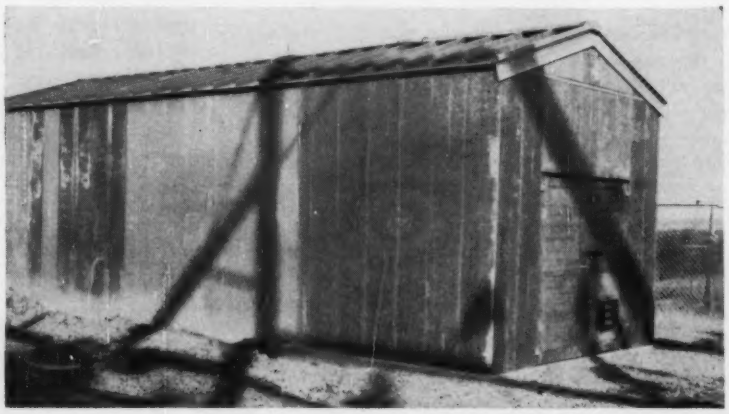
Appalachian Electric now buys new roof panels, two wall panels, and one new building end without the gable portion. No original building walls are removed except the gable panel adjoining the extension. The entire extension can be installed by using sheet metal screws to fasten the joints between the building and extension.

Parts, Methods Standard

The extension can be erected without opening the original building to the weather, as its gable panel, which is transferred to the end of the extension, is not moved until the last moment. All parts and methods of assembly are standard, except the joint between the original and added section.

(*More How To on page* 180)





New General Electric Atomic Lab to Help Cut Cost of Nuclear Power

The new General Electric Vallecitos Atomic Laboratory in Pleasanton, California, will develop and test new ideas aimed at reducing the cost of atomic-generated electric power.

The new laboratory, to begin operation in 1957, will initially consist of a Critical Assemblies Building (1), a Radioactive Materials Lab. (2), and a full-scale developmental Boiling Water Reactor (3).

The Boiling Water Reactor will permit tests of both natural and forced circulation, core configuration experiments, and either single- or dual-cycle operation. Steam produced in this reactor will also be used, through a joint arrangement with Pacific Gas & Electric Co., to generate the first all-privately-financed atomic-electric power.

The Vallecitos Atomic Laboratory is further evidence that General Electric will maintain engineering leadership in the field of atomic energy.

Atomic Power Equipment Department, General Electric Company, Schenectady, N. Y. 196-2

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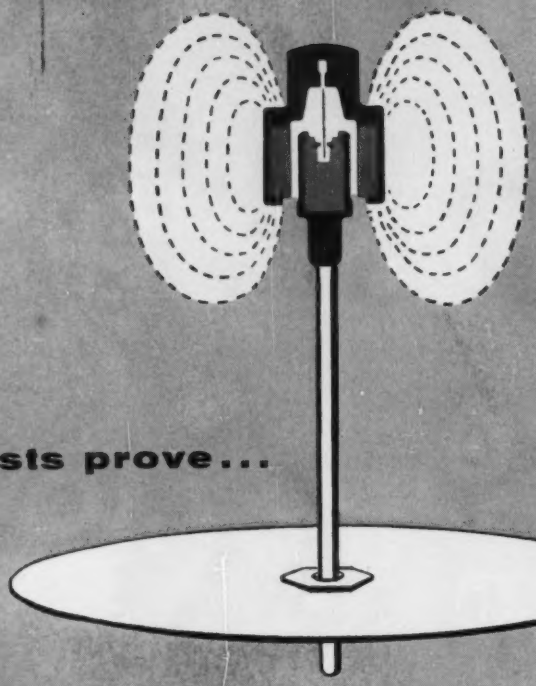
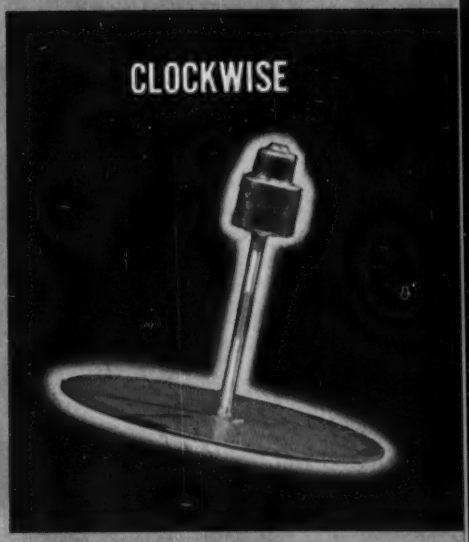


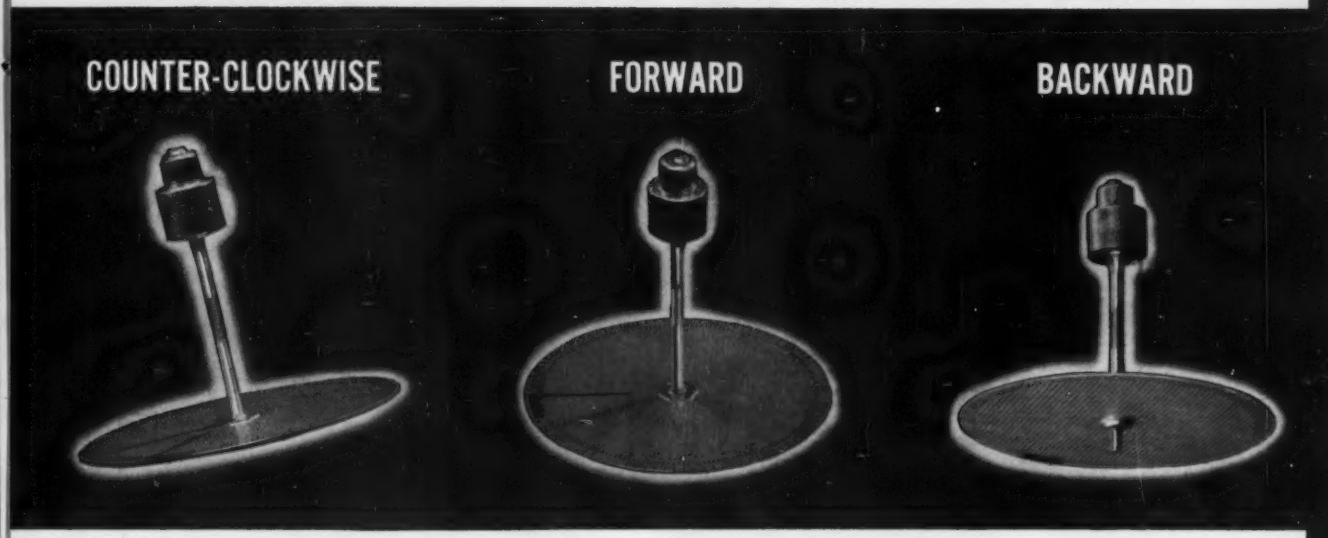
Lab tests prove...



MAGNETIC SUSPENSION

General Electric's New "PERFECT PARTNER"

the S-1 square meter socket, designed for use with extended-range meters such as the G-E I-55 on installations up to 100 amps.



CUTS METER TILT LOSSES

"FLOATING DISC" OUTPERFORMS BALL BEARING SYSTEMS AT ANY TILT ANGLE

It's a basic fact that the more friction in the bearing system of a watthour meter, the less accuracy you'll obtain. One of the common causes of such friction is a slightly tilted meter. Ordinary watthour meters can and do develop increasingly more friction on the bearing system at any angle of tilt. General Electric I-55 meters with the revolutionary "floating disc," however, have virtually eliminated friction in the bearing system. This means that should a G-E meter be tilted, any loss in accuracy will be practically negligible.

A recent series of tests conducted at G-E laboratories analyzed meter performance at various degrees of tilt. They conclusively indicated that the I-55, due to the superior inherent characteristics of the magnetically suspended rotor, out-performed every other meter. Held under both full and light load conditions, the tests showed the I-55 least affected by tilt—at forward, backward, clockwise and counterclockwise positions. As the angle of tilt was increased on ordinary meters with ball bearings, additional friction resulted. G-E meters with magnetic suspension developed no measurable friction when operated out of plumb . . . even as the angle of tilt was increased. Life of the bearing system was not affected and errors in registration were negligible.

Protection against tilt errors, and other types of inaccuracies that cause serious loss of revenue, is only one of the many ways that G-E meters help pay for themselves and protect you with accurate measurement of all the energy you supply. For other important money saving benefits—greater sustained accuracy, longer meter life with less maintenance and testing time, and elimination of bearing replacement—specify G-E meters of the I-50 family . . . the only meters with the "floating disc."

For more information, contact your nearby G-E Apparatus Sales Office, or write General Electric Company, Section 621-8, Schenectady 5, N. Y.

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W. J. RUDGE, *Mgr*—Lightning Arrester and Cut-out Engineering, points to newly designed Magne-valve gap—the reason for General Electric's smaller, lighter distribution arrester. Both types, directly connected (standing) and externally gapped (on table) use exclusive Thyrite* Magne-valve operating principle.

HI-SPEED, EFFICIENT ARC INTERRUPTION

Movie frames show how rapid rotation of arc and extinction of follow current in less than one-half cycle prevent localized heating—help the new Magne-valve arrester protect against subsequent surges.

Here's why General Electric's

NEW MAGNE-VALVE DISTRIBUTION ARRESTERS

pack more protection in less space

General Electric's new Thyrite Magne-valve distribution arresters are the smallest and lightest valve arresters on the market today. Some ratings are as much as **40% lighter** than competitive models. These features make the arresters easier to stock, handle and install—help to eliminate clearance problems.

Operating principle. In order to obtain smaller size and lighter weight, General Electric engineers have applied exclusive Magne-valve action to these arresters. A space-saving, concentric ring gap unit was designed to pack more protection in less space. Like the service-proven Magne-valve station- and line-type arrester gap units, the new distribution arrester gap helps maintain consistent spark-over voltage and assures efficient power-current arc interruption.

High discharge capacity. These arresters also have capacity for high discharge currents exceeding that of any other distribution arrester. They easily withstand the 65,000-amp AIEE standard discharge current test. Also, long duration discharge and duty-cycle tests have demonstrated their superior performance under all conditions. Both types provide positive line-lockout prevention.

Two types. General Electric offers you a choice of two types, directly connected with ground-lead disconnect or externally gapped. Every arrester in both series offers complete system protection and many advantages over expulsion arresters—including better impulse protection, longer service life and universal application anywhere on the system regardless of short-circuit capacity. Ratings from 9- thru 18-kv are available in both types. Dependable G-E pellet arresters are still available for voltage ratings of 3- thru 15-kv.

For complete information on this new line of G-E distribution arresters, call your nearest G-E Apparatus Sales Representative or write for bulletin GEA-6379, General Electric Company, Schenectady 5, New York. 432-18

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**Registered Trade-mark of General Electric Company for molded resistance material.*

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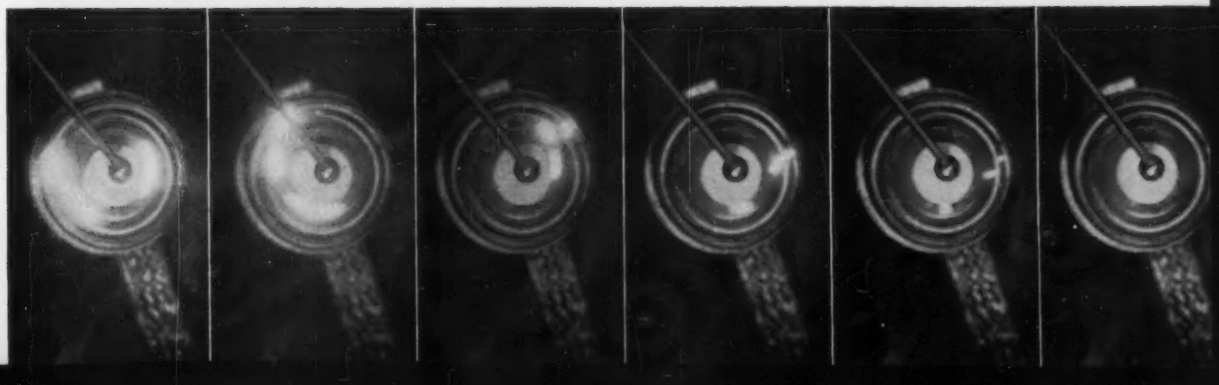
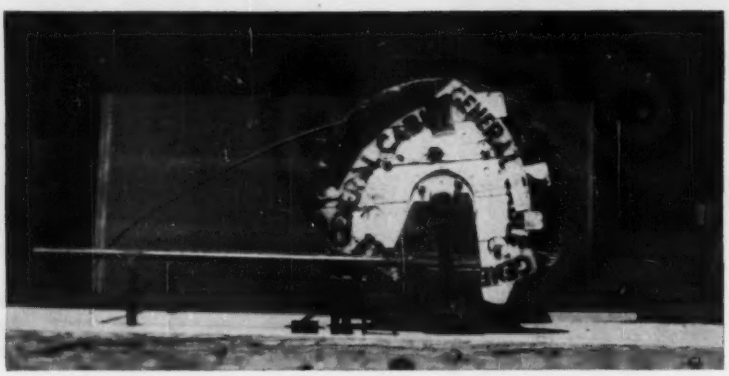
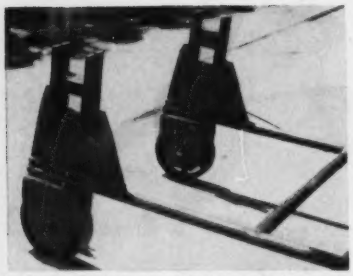






HEAVY REELS are lifted easily, safely by one man with simple truck. H-shaped brackets slip over-Ushaped mounts to accommodate larger reels

Lift Truck Raises Small or Large Reels

JOHN F. GRABNER, San Joaquin Division, Pacific Gas & Electric Co, Fresno, Calif.

Heavy cable reels are lifted quickly and safely by one man with a lift truck at Pacific Gas & Electric Co. The truck is designed to lift reels of different diameters.

Formerly, the company used a four-screw jack with shafts to raise a reel. This two-man operation required about 40 min to raise the reel off the warehouse floor.

The lift truck is designed to slip under a bar through the reel and lift it as the truck handles are lowered. The truck is made of steel pipe and steel plates welded together. The frame is welded to housing which holds steel wheels.

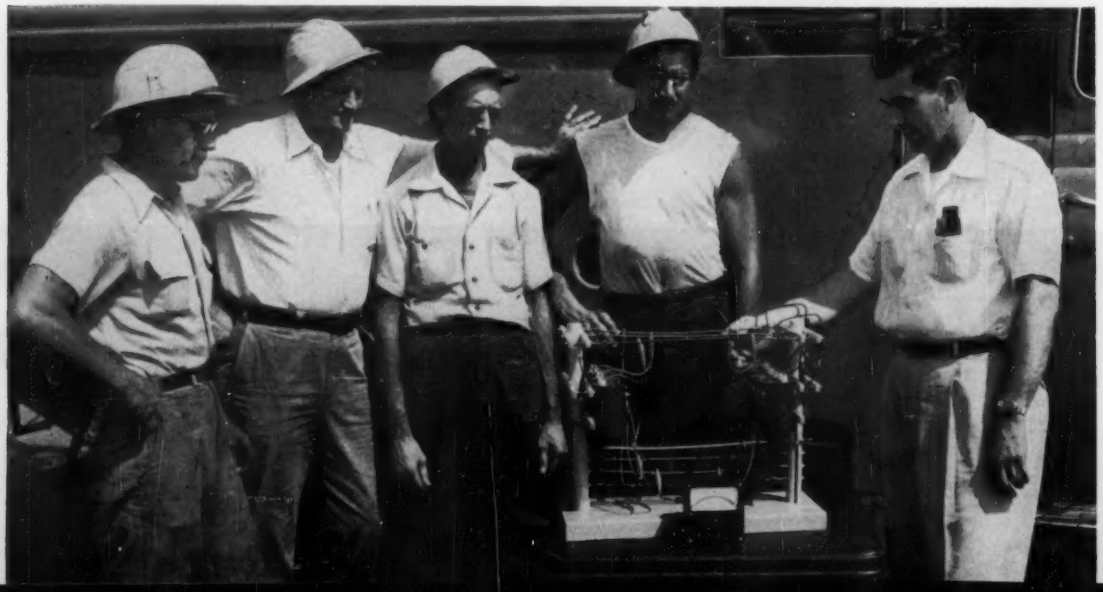
The lifting bar through the reel rests in U-shaped mounts on top of the steel plates. H-shaped bar steel brackets fit over these mounts to accommodate larger reels. Steel bars, which can be slipped into slots in the brackets, provide additional height for the largest reels.

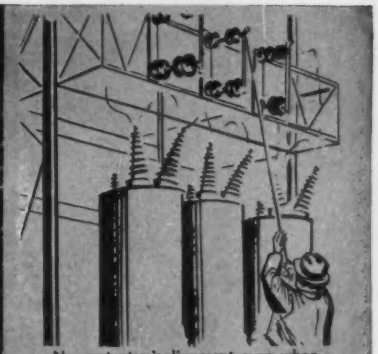
Demonstrates Transformer Hookups on Model

Jerome Rosman, Indiana & Michigan Electric Co engineer, demonstrates complex transformer hookups for linemen on a model having two poles and two transformer banks. The linemen can practice the hookups on the model in preparation for a particular job.

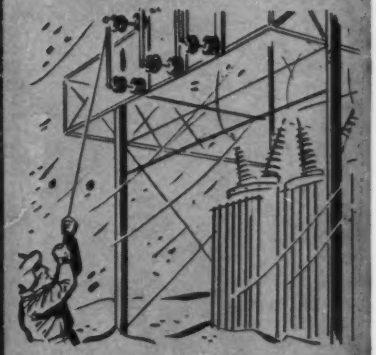
The model's transformers, housed in tomato cans, produce secondary voltages of 120/240 v. There have been no questions concerning transformer hookups since the company began using the model. It clarifies connections formerly difficult to make correctly even with drawings.

(*More How To on page* 189)





No contact misalignment even when switch is operated from the side.



Easy operation even under severe atmospheric conditions.

How to judge the merits of

DELTA-STAR Hook Operated B-2K Disconnects

Consider each advantage offered by B-2K Outdoor Disconnect Switches in light of your specific needs. One or two advantages may stand out—or all may be equally important to you.

You are assured of *long service life* because of rugged, rigid construction, with flared or split tubular blades. This rugged construction also *prevents contact misalignment* even when operator must stand to one side to open or close the switch. *Easy operation at all times* results from efficient blade pryout and lock assembly, with large 3 in. diameter hook ring. The B-2K features *efficient heat dissipation* because ample material is used throughout. Contact pressure-applying springs carry no current, and offer large deflection to *maintain uniform high pressure* contact over extended periods of use.

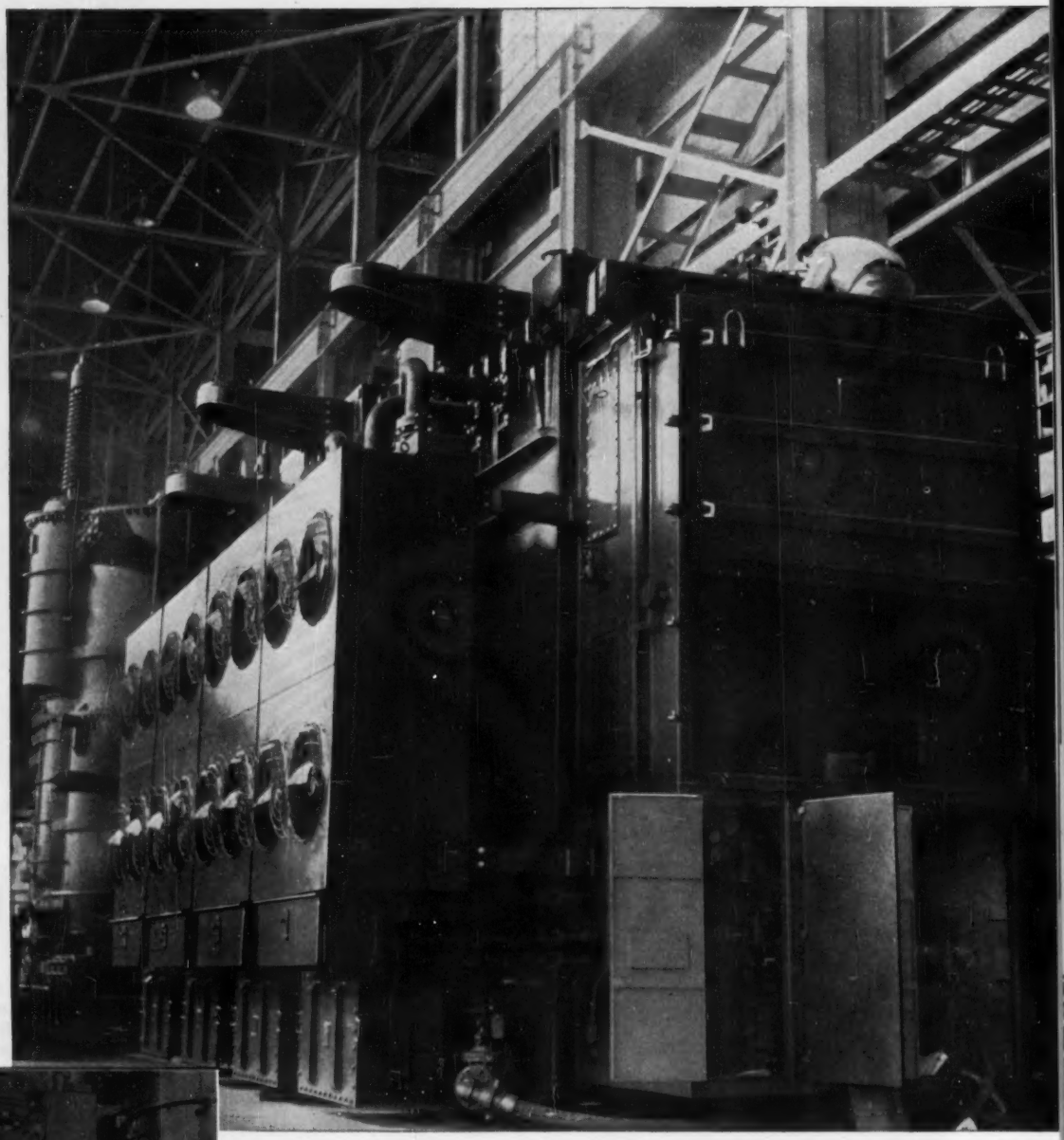
Delta-Star B-2K Disconnects are available in three ampere ratings—1200, 600 and 400—and in voltage ratings from 7.2 kv to 161 kv. They meet your requirements in every respect.

Write for new B-2K Disconnect Switch Catalog or ask your nearby Delta-Star representative for your copy.

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

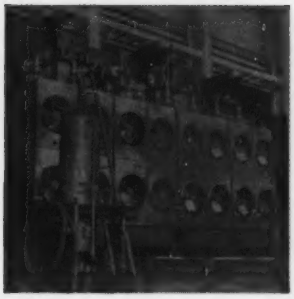
2437 Fulton Street · Chicago 12, Illinois · District offices in principal cities



M O L O N E Y E L E C T R I C

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers
Transformers • Unit Substations • Network Transformers • Constant Current Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO.



At
MOLONEY...
Abilities
and
Facilities

are combined to design, fabricate and assemble transformers for the electrical utility industry ...proven in operation to be... "Dependability at its Best."

MK55-31

C O M P A N Y

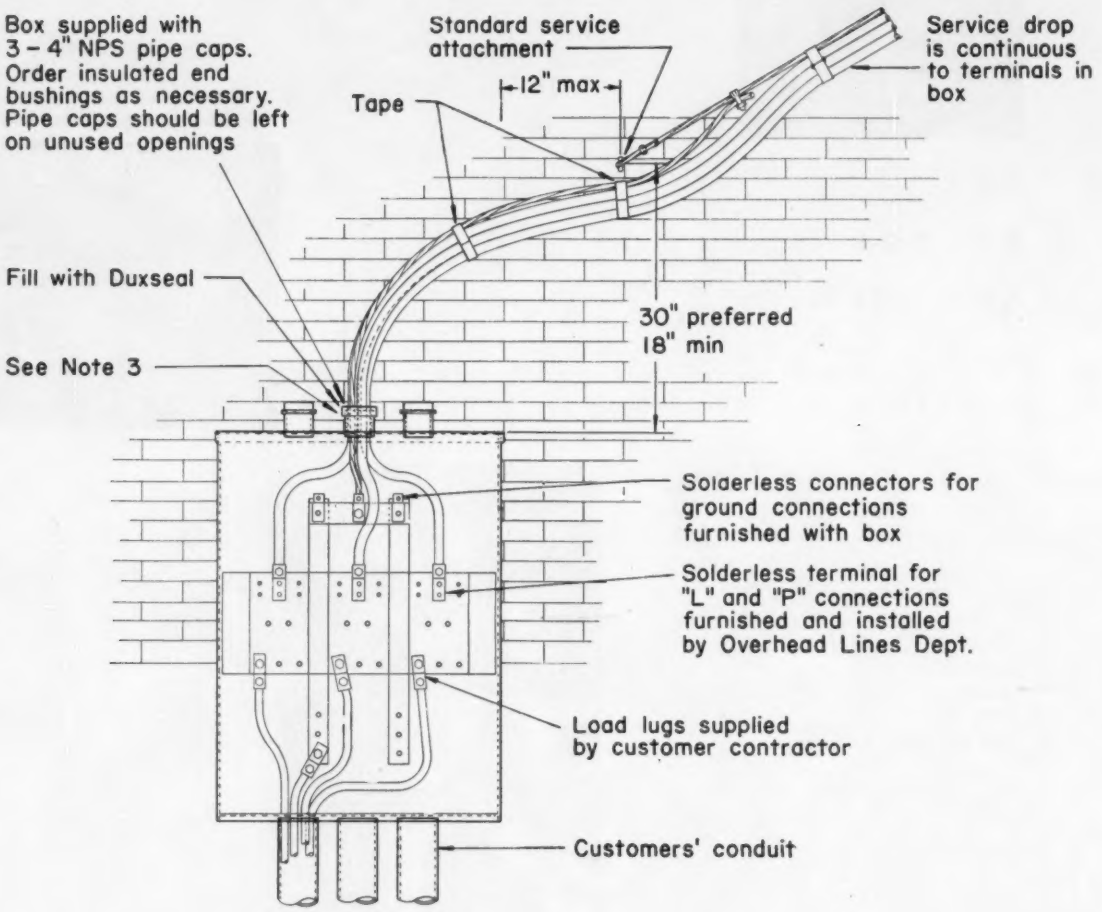
Load Tap Changing Transformers • Load Center Capacitors • Transformers For Electronics

AND TORONTO, ONT., CANADA

MOLONEY ELECTRIC

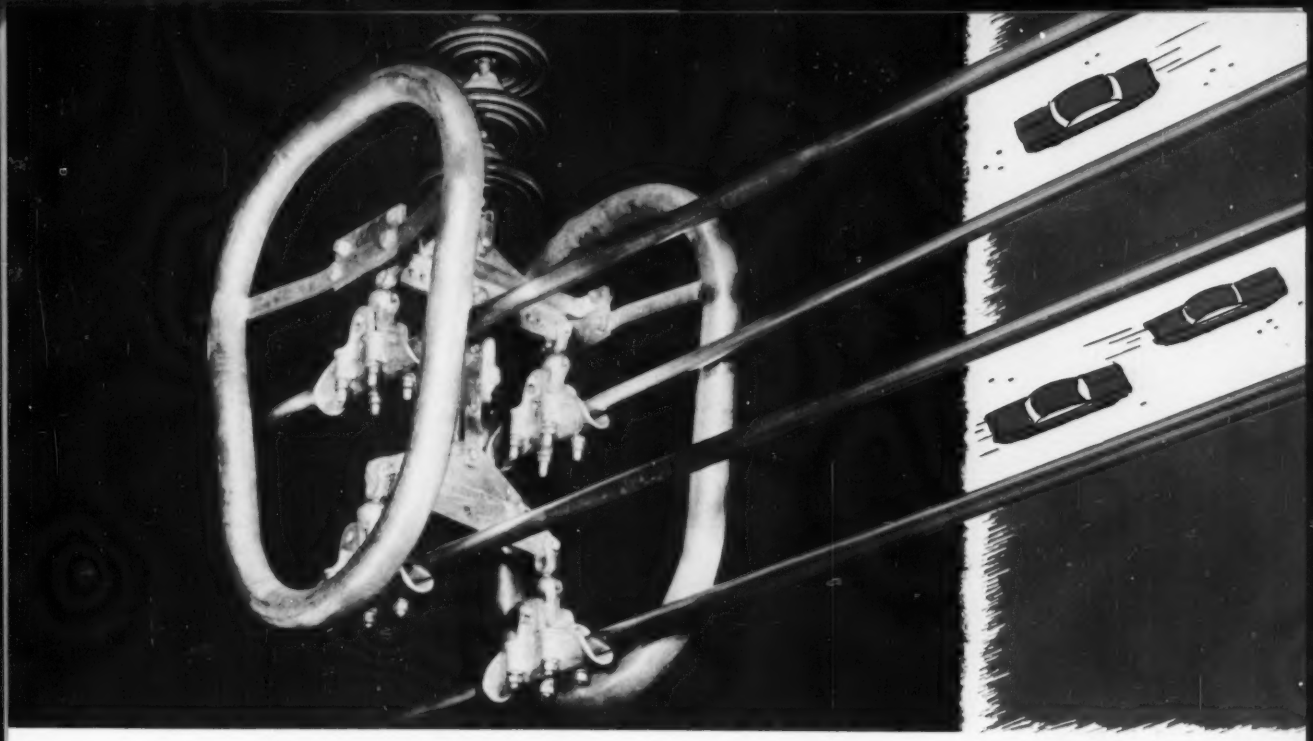
Overhead Service Terminated in Cabinet

This method for terminating overhead service drop in a cabinet is an adaptation from Overhead Lines Manual of Detroit Edison Co.


Box supplied with 3 – 4" NPS pipe caps. Order insulated end bushings as necessary. Pipe caps should be left on unused openings
Standard service attachment
12" max
Tape
Service drop is continuous to terminals in box
Fill with Duxseal
See Note 3
30" preferred
18" min
Solderless connectors for ground connections furnished with box
Solderless terminal for "L" and "P" connections furnished and installed by Overhead Lines Dept.
Load lugs supplied by customer contractor
Customers' conduit

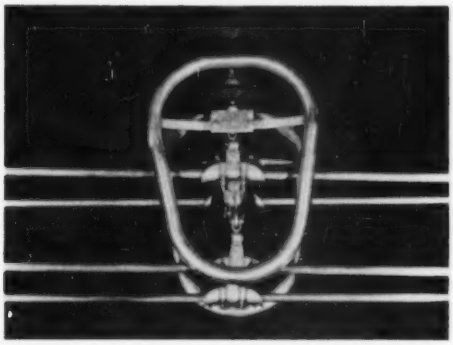
NOTE

1. Cabinet is installed by customer
2. Cabinet will accommodate one to three single- or three-phase D. E. Co. service drops, and one to five sets of customer's wire.
3. All phase and ground wires of a single service drop must enter the same opening.



Tomorrow's Electrical Turnpike

In the new field of Bundle Conductors, the knowledge and materials will be ready for you



Experimental four-element bundle conductor under test in the O-B High Voltage Laboratory. Other numbers and configurations have also been investigated. In order to work under the most highly controlled conditions, and to determine the fundamental principles involved, smoothly polished tubes are used in place of conventional cables.

When the day comes that bundle conductors are commonplace, we will probably look back at this laboratory set-up and call it primitive. But the fundamentals are here; spacing, configuration, shielding, and maximum number of standard items. And fundamentals are the things we seek today.

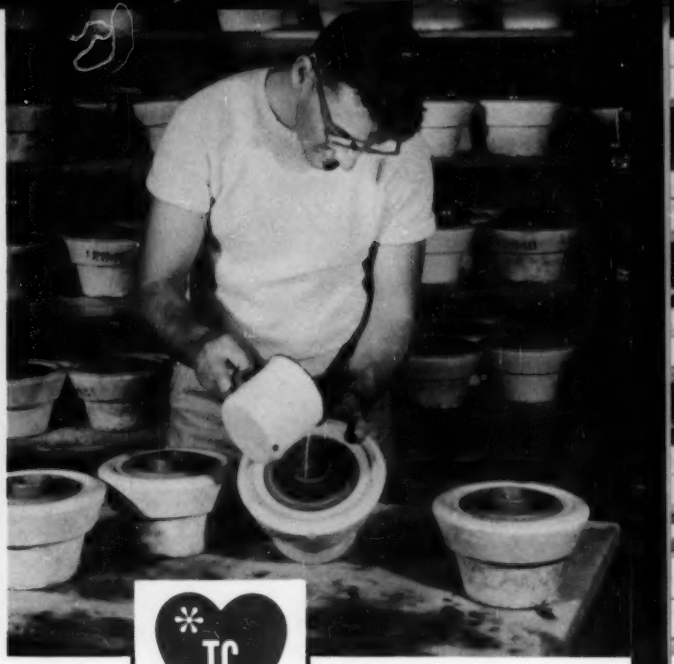
Months of testing have been performed in the O-B High Voltage Laboratory. We have investigated the feasibility, the pitfalls, the virtues of bundle conductors in different numbers and in dozens of different forms. It might be presumptive to say we have *all* the answers, but we have explored and mapped a lot of virgin territory.*

Meeting progress -- or sometimes trying to catch-up with it -- is the more normal role of a manufacturing organization. But, at O-B, we *make progress!* And when the time arrives for you to consider converting your present electrical "highways" into "turnpikes" by means of bundle conductors, the knowledge and the materials will be ready for you.

*AIEE Paper, "Mathematical Prediction of Radio and Corona Characteristics of Smooth Bundled Conductors," By C. J. Miller, Jr., Ohio Brass Co. Copies available on request. Please refer to O-B Publication No. 1362-H.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada, Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

the heart of every *Ohio Brass* insulator



How We Manufacture Pintype Insulators To Do

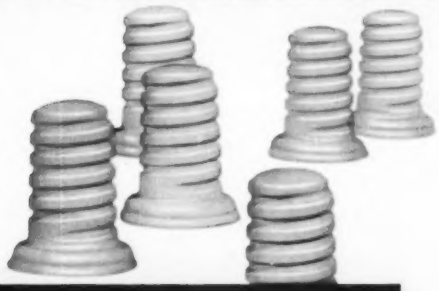
All of Their Job

Good Fit on the Pin . . . A Construction Time and Money-Saver . . . Is Assured by Ingenious Inspection

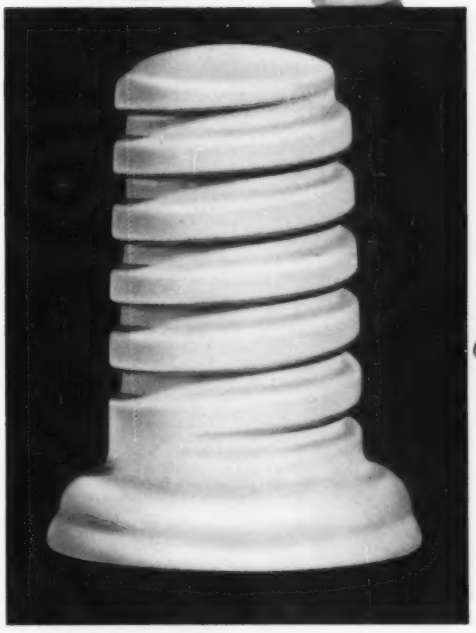
How would you precision-measure a threaded hole in a piece of soft clay, easily and accurately? This question confronted our pintype insulator inspectors. O-B threads must -- and do -- fit the pins. But, the abrasive clay wears threading tools. Machines may lose adjustment. Men can even make mistakes. Therefore, frequent samplings of pinholes must be gauged and, for economy, gauged right at the start when the clay is soft; when costs are lowest.

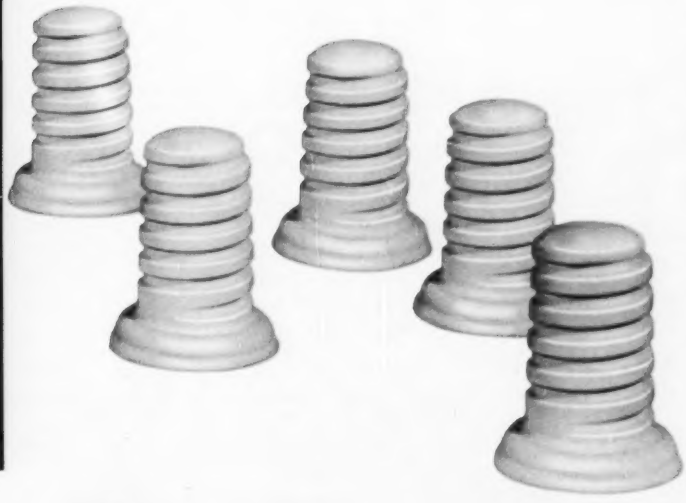
Here is a story of ingenuity. Now, it seems perfectly simple and obvious. If it *were that simple*, or if it *were that obvious*, however, O-B insulators could not have gained their long-standing reputation for being the only pintypes you can trust to fit the pins.

Utility in the hands of the user is as essential as flashover or mechanical strength, and it shows-up quicker! This thinking in terms of *all the things* a product must do puts the emphasis on Technical Competence, the heart of every O-B insulator.

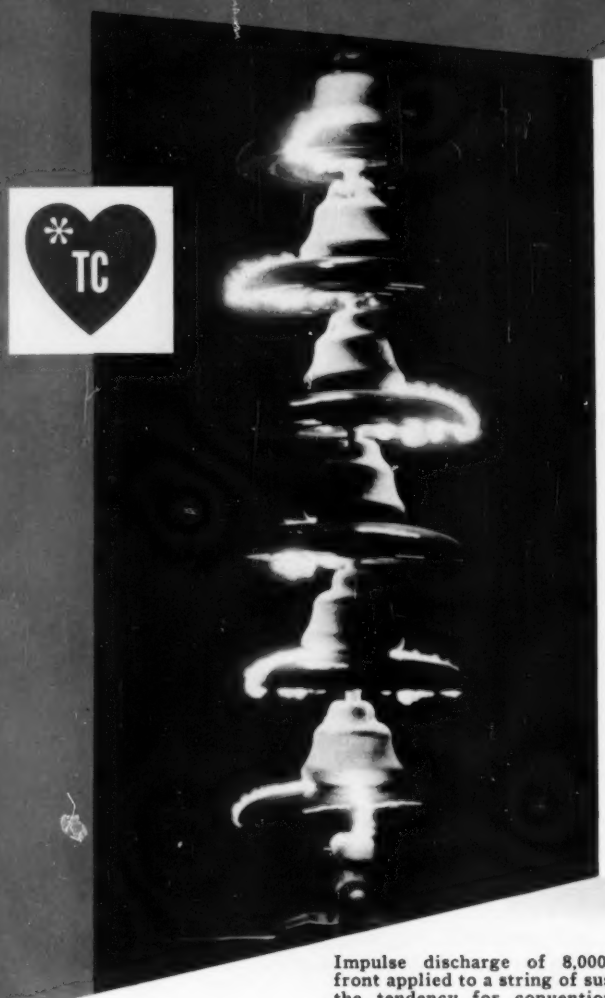


In its freshly-moulded state, a pintype insulator is softer than putty. Any customary gauging operation of the threaded pinhole would deform it, and thus give no answer. We measure these threads, however, down to the thousandth of an inch. This is done by pouring into the pinhole a thin mixture of special non-shrinking plaster. When hard, this cast is removed from the plastic clay and all gauging operations performed on it. Illustrations show steps in this ingenious process.





* TECHNICAL COMPETENCE the heart of every Ohio Brass insulator



It shouldn't happen to an insulator!

Wave Fronts Twice the Speed of Lightning Open Door to More Realistic Testing

Impulse discharge of 8,000,000-volts-per-microsecond wave front applied to a string of suspension insulators. In contrast to the tendency for conventional impulse flashovers to jump through free air around the string, this discharge hugs every surface; even following the shape of the underside petticoats, as the picture shows. Such a test wave is highly destructive and typical of lightning at its worst -- a valuable new research tool.

Have you ever wondered how faithful to nature are the standard lightning tests applied to an insulator? So have we!

Now, the O-B High Voltage Laboratory is capable of applying, *routinely*, an impulse wave front of 8,000,000 volts per microsecond. This is twice the recognized wave front of lightning. Its behavior is entirely new. Its destructive ability is many times more severe than standard test requirements. It is a boon to the design engineer looking for chances to improve the product.

This is more than just a change in rigging the impulse generator. Some of the control and measurement techniques to make such testing practical are almost fantastic.

But, in making the insulators on which you place so much dependence, new tools have been put in the hands of research men. Today, they can take a product already of highest reputation, and make it still better!

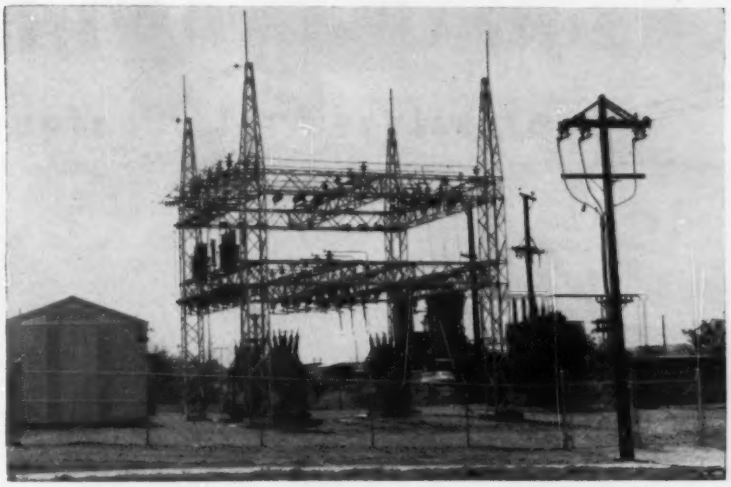
OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada, Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every *Ohio Brass* insulator

4658-

Old OCB's Replace Motorized Air Switches

JERRY A. SELVAGGI, Distribution Engineer, Pennsylvania Electric Co, Erie, Pa.



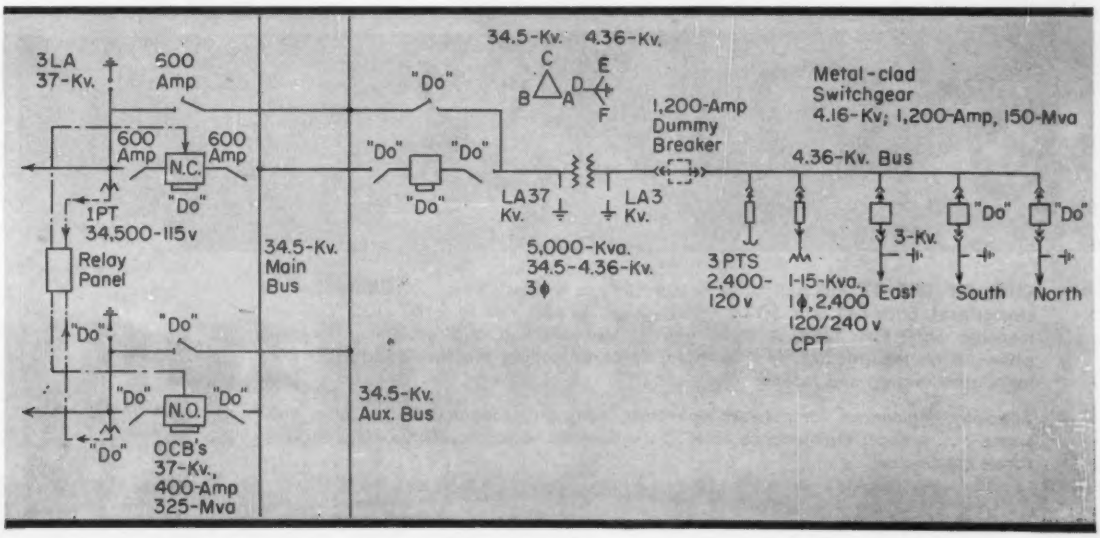
Old oil circuit breakers replace motor-operated air break switches for transferring Wesleyville substation's 5,000 kva step-down transformer from a preferred to an emergency 34.5-kv circuit. These breakers provide enough interrupting capacity to clear a fault manually. Moreover, the cost of using breakers, which otherwise would have been scrapped as too slow to coordinate properly with other high-speed protection, was less than the purchase of new motor-operated mechanisms.

Distribution substations of this type usually have two in-coming lines with motor-operated air break switches, one relay cabinet to control the operation of the switches, two potential transformers to signal the operation of the relays, one or more 3-phase transformers, and low-side breakers.

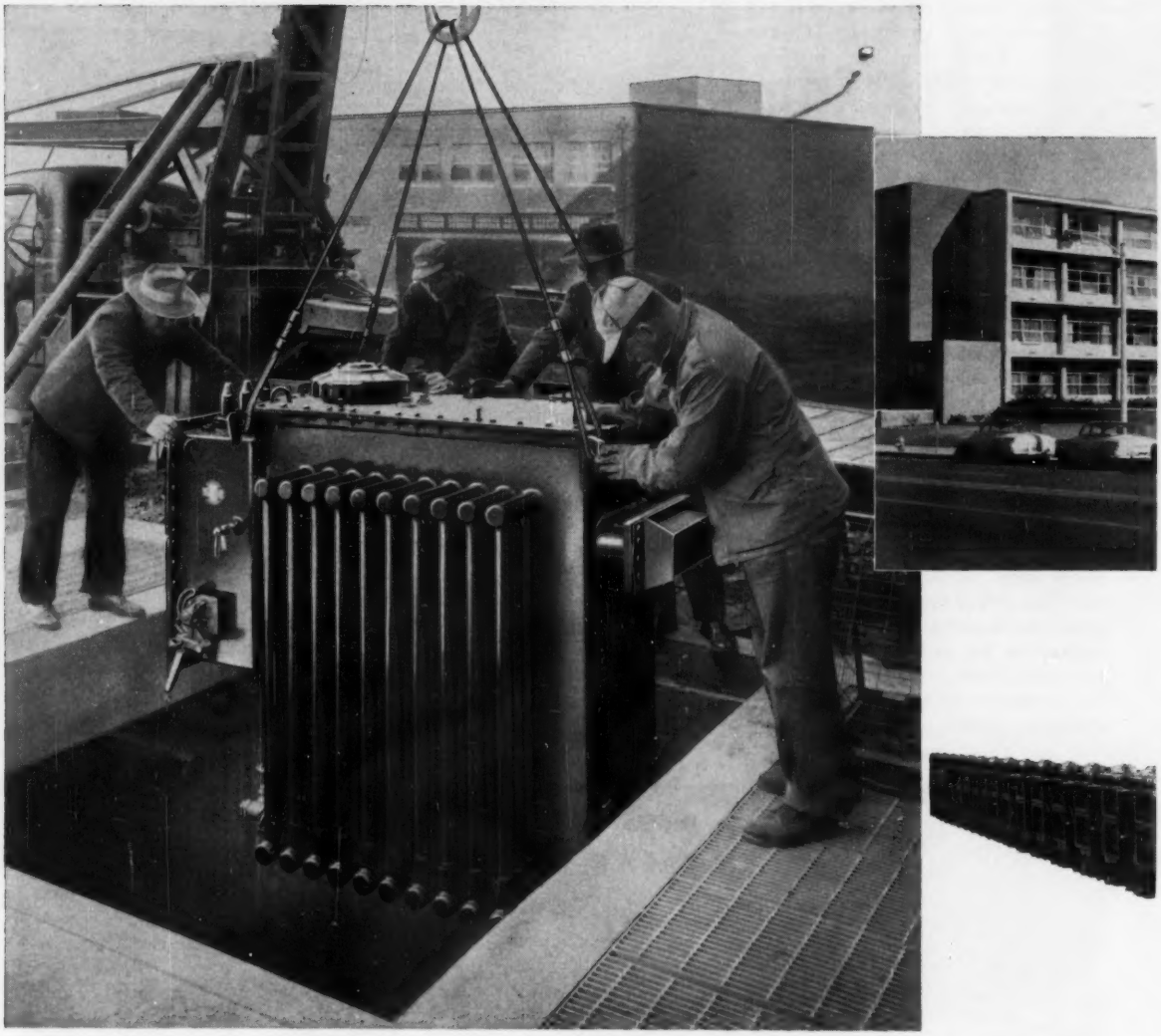
At these substations normal operating procedure is to motorize the two 34.5-kv air break switches with one normally closed and the other normally open. On loss of voltage, the preferred switch opens and the emergency switch closes. On restoration of voltage on the preferred circuit, its air break switch closes, and this closing is followed by the opening of the emergency switch.

When this type of substation was designed for Wesleyville, there was a surplus of old oil circuit breakers from the modernization of several large substations. These breakers were no longer suitable for their usual application because of their slow interrupting time, but were easily adaptable for a primary selective arrangement. As the 4.16-kv metal-clad switchgear utilized 125-v dc to close and trip, control power involved no additional expense. Other advantages from the installation of these breakers instead of motor-operated switches are that additional expenditures for modern breakers for subsequent substation enlargement can be deferred and that the use of breakers insures positive operation. Most of the steel and switches was reconditioned for use.

The cost of installing the two line breakers, together with their individual footings, was only about $200. The cost of purchasing and installing two motor mechanisms would have been $1,600. Thus there is a net saving of about $1,400.



47 KUHLMAN



ONE OF THE 47 Kuhlman network transformers is shown being lowered below the street level. Each unit is a 500 KVA, 3 phase, 12480 Volt to 216Y/125 Volt submersible Saf-T-Kuhl type. A three position disconnecting and grounding switch is provided on the primary side for isolating or grounding the feeder cables during installation, testing and maintenance periods.

Specially engineered for network operation, Kuhlman's compact design saves vault space . . . reduces maintenance costs . . . withstands underground flooding and corrosive conditions.

NETWORK TRANSFORMERS

assure uninterrupted vital service for modern hospital area in Memphis

With nearly all of its hospital facilities growing and concentrated in one area, Memphis, Tennessee made careful plans for the future.

Memphis Light, Gas and Water Division engineers knew from experience that Kuhlman's dependability would meet the vital requirements of this modern hospital area. They also knew that a network system would protect service continuity under all operating conditions and offer low cost flexibility for future load increases.

As a result, 47 Kuhlman 500 KVA network transformers were installed in a project requiring an initial investment of approximately a million dollars. These units replaced the City's underground system of transformers ranging from 50 to 150 KVA. Feeder lines were increased from 4 to 12 KV.

Like Memphis and other progressive communities, it will pay you to plan the future of your growing load areas with Kuhlman network transformers. Get all the facts—write or ask for Kuhlman network bulletin CS-1200.

HOUSEPOWER HELPS YOU LIVE BETTER ELECTRICALLY

LIVE BETTER ELECTRICALLY

5610

KUHLMAN

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

Electric Forge Welder Makes Floor Grating

J. H. TARBELL, Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

Floor grating is being electrically forged at the Arrowhead Iron Works plant in North Kansas City, Mo. The plant had required a large number of people for cutting, bending, riveting, and processing their product under the former system.

Rate 1,000 Sq Ft a Day

A 1,000-kva forge welding machine now turns out all-welded grating at the rate of 1,000 sq ft in an 8-hr day and requires only two operators.

This reduction in time and labor is a substantial saving over the old production method.

Controls Electronic

Operation of the machine is electronically controlled and entirely automatic.

Horizontal bars are fed with transverse members into the machine.

Distortion Compensated

Pressure and current are applied in proper sequence producing an homogeneous unit and resulting in a finished product of great strength and uniformity.

Furthermore there are no seams or joints to collect dirt and form rust.

The machine is designed with compensation for all distortion caused by heat developed from the weld. No post-production straightening is necessary.

1,000-KVA FORGE WELDING machine produces 1,000 sq ft of floor grating in an 8-hr day. Only two operators are needed. Machines are electronically controlled

Better Light in New Plant Raises Toy Mfg Efficiency

GOOD LIGHTING formed the building blocks which enabled a toy manufacturer to construct a more efficient output

G. J. GILLEN, Sales Technical Representative, Con Edison, New York, N. Y.

Better lighting in its new plant has paid off handsomely in manufacturing efficiency for Knickerbocker Toy Corp, Brooklyn, N. Y. The company's new plant enjoys an 80 ft-c lighting level in its manufacturing areas. This illumination is obtained through 2-lamp 96-in. fluorescent fixtures assembled in continuous rows about 7 ft above the floor. Rows are about 8 ft apart. Total lighting load is 18 kw, using warm white fluorescent tubes throughout the area.

Formerly the customer, at another location, had been operating his plant with a maximum lighting intensity of 30 ft-c, which he felt was inadequate. The new lighting, combined with light walls and ceiling in the manufacturing areas, creates comfortable surroundings, conducive to top manufacturing efficiency not often found in similar establishments.

Save time and money by using

G&W

unit package

Splicing Kits

ENGINEERED FOR BETTER CABLE JOINTS

G & W SPLICING KITS include each necessary item of material in the correct grade and proper quantity for making a cable joint of our standard design (or your own design or special type).

For your convenience, we carry in stock all the materials required to make joints on any size cable and we regularly supply these materials in unit package form.

When You Order Cable Splicing Materials in Unit Package Kits You *Save Time and Money* Because—

- Time and expense of securing various items from different sources are saved.
- No lengthy material specifications are necessary.
- Both design and installation methods can be standardized.
- All joints are properly designed to industry standards by expert engineers.
- Each item is supplied in the correct quantity for a properly designed joint.
- Accumulation of dead stock is avoided. No waste.
- All materials are kept clean and ready for use.
- Each Unit Splicing Kit is labeled for easy identification.
- Easy to quickly estimate costs for any particular job.

Send for your copy of publications

BULLETIN JA56—(Supersedes bulletins CJ1, CJ2, CJ3, CJ4, CJ5, CJ6R) List prices—2 way & 3 way Splicing Kits.

BULLETIN JB56—(Supersedes CJ7) List prices Terminating Kits.

BULLETIN JC56—(Supersedes CJT) Telephone Cable Splicing Kits.

G&W ELECTRIC SPECIALTY CO.

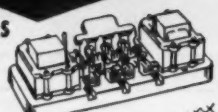
7780 Dante Avenue, Chicago 19, Illinois, U.S.A.

Representatives in principal cities of U.S.A.
Also Made In Canada by Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

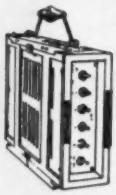
J561

Recommended
these
METER
TESTING
ACCESSORIES
Now in use
by Leading
Utility Companies

PHASEFORMERS



ACCURATELY MEASURES RE-ACTIVE POWER: when properly connected to a watthour meter will provide for that meter the proper potentials lagging 90° in phase from the normal circuit potentials, together with a switching arrangement whereby the meter connected thereto can be checked as a straight watthour meter.

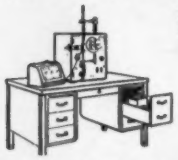


TYPE TRF RESISTANCE LOAD

The addition of a current operating fan on this item is to aid the natural draft condition and make possible a maximum capacity of 24 amperes load current at 240 volts in an aluminum case.

ROTARY TAP SWITCH

ALL INCLUSIVE FEATURES: high current capacity, non-arcing, high voltage capacity, inductive load capacity, numerous circuit combinations, special high current connections, positive action, compact design, fully enclosed.

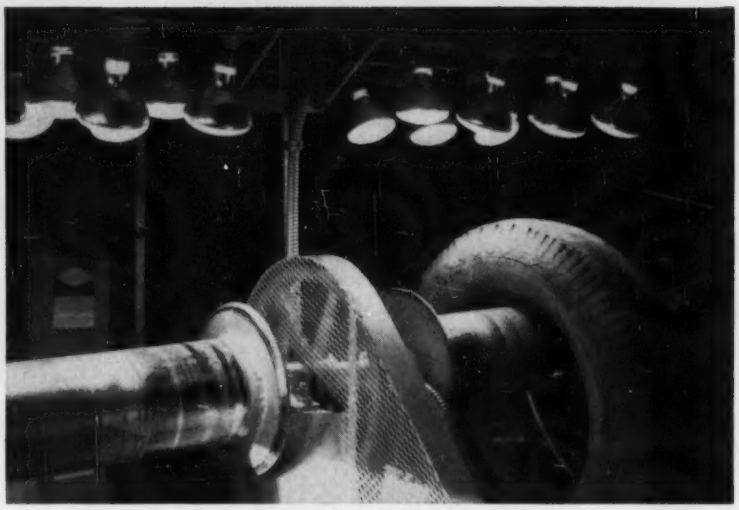


METER TEST BOARD

So many requests have been received to provide a packaged, up-to-date, compact meter test board unit, we are presenting this equipment which has many features for efficient operation.

Write for Complete Information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.



OLD TIRE CARCASSES are turned slowly under two banks of infrared lamps during wet weather by this motor-driven device. Tires should be dry for recapping

Infrared Eliminates Defective Recaps

HUGH J. RICHARDSON, Commercial Sales Representative, Pacific Gas & Electric Co, Chico, Calif.

Drying tire carcasses with infrared heat lamps before recapping has proved an effective and economical way to eliminate defective recaps during wet weather for Watson and McWhorter Co, Chico, Calif.

Removal of moisture is necessary to avoid a build-up of steam pressure between the carcass and new rubber while the recap is being applied. If this occurs, proper adhesion is not obtained.

The firm previously placed the tire carcass in a recap mold and baked it dry. This method worked satisfactorily but had the disadvantage of tying up a recap mold often needed on rush orders.

To speed the operation, a homemade machine was devised. It consists of two drums upon which the tires are placed. The drums are rotated slowly beneath two infrared banks consisting of nine 250-w heat lamps each. The banks are separately switched to provide economical drying of one to four tires at a time and are mounted 24 in. above the drums. Drying time now ranges from 1 to 4 hr depending upon tire size.

No estimate of the annual saving has been made, but the operators believe that the machine has paid for itself during the first year of operation by reducing defective recaps. Additional production also has been achieved because recap molds no longer are tied up in a baking operation.

Over-Hang Lamps Brighten Firm's Facade

Fluorescent luminaires normally used for road signs provide a bright setting for General Cable Corp's 8-ft high aluminum facade. The lamps extend 3½ ft from the building to emphasize 1-ft high block letters set 1 in. away from the corrugated sheet siding.

Nine 8-ft fluorescent tubes are used to illuminate the 75-ft wide aluminum section of the Monticello, Ill., firm. The manually controlled installation and the paper and lead telephone cable manufacturer's interior electrical system was performed by Fischbach & Moore, Inc.

GENERAL CABLE HITS THE TARGET on Delivery and Service!

Making your job easier and better, General Cable backs up distributors unconditionally with 'round-the-clock support, hits the target with quick delivery and dependable service on every job. GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, New York. Offices and Distribution Centers Coast-to-Coast.

***be specific . . . specify* GENERAL CABLE**

99.6% SURE
His health depends on continuous electric power . . . on the farm, in the dairy, in the home . . . to assure proper pasteurization and refrigeration of his milk. That's where C-D's field-proved dependability pays off . . . regardless of changing weather or power load conditions. The thousands of C-D power capacitor installations . . . all with records of 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in contributing to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.
CORNELL-DUBILIER CAPACITORS
consistently dependable for power-factor improvement
PLANTS IN SO. PLAINFIELD, N. J., NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS., PROVIDENCE AND HOPE VALLEY, R. I., INDIANAPOLIS, IND., SANFORD AND FUQUAY SPRINGS, N. C., SUBSIDIARY RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER power-factor capacitors give you better than 99.6% trouble-free service*

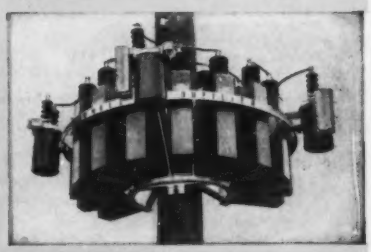
Lowest volts per mil unit stress results in the extra margin of safety necessary to withstand all system high voltage transients. This lower volts per mil and lower volts per section feature is the utility's assurance of extra longevity in its capacitor purchase when Cornell-Dubilier's are specified.

Only C-D power capacitors are subjected to a full-rated voltage energization test. C-D removes potential trouble-makers before they get on your poles . . . not after with costly replacements.

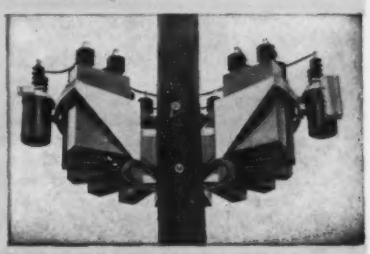
Lowest unit dielectric stress not only provides lowest voltage gradient for steady state operating conditions, but also highest withstand protection against the transients produced by lightning, circuit breaker re-strikes and all other line surges.

Heavy major insulation in the form of laminated liners, with reinforced corners insures highest impulse withstand levels. It means, too, a heavier capacitor unit . . . because it's a better unit . . . but at no extra cost to you. How would you relate a slight increase in weight to years of trouble-free service?

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



C-D's new semi-round pole mounting Contour Capacitor® Rack.



***This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.9%.**

INDUSTRIAL BRIEFS

New lighting improved redwood lumber grading and brought a substantial reduction in lumber returned to the trim saws at the Pacific Coast Lumber Co, Willits, Calif. The lighting was installed in accordance with recommendations of the preliminary report of the Illuminating Engineering Society's "Lighting for Redwood Lumber Grading."

The trim saw area is illuminated by three 20-ft rows of three-lamp slimline fixtures, spaced 3 ft apart and 7 ft above the working area. The illumination level is over 150 ft-c.

The green chain area, where final grading is done, is illuminated by five rows of three-lamp slimline fixtures, spaced 4 ft apart and 4 ft above the working area. The illumination level is over 150 ft-c. Mark S. Jensen, Commercial Sales Representative, Pacific Gas & Electric Co, Ukiah, Calif.

Conditioning tobacco by the use of electricity has been extended to a second plant in the Tennessee Valley Authority region. The new plant at Clarksville, Tenn., largest to date, is conditioning tobacco at the rate of about 32,000 lb a day and has a capacity of several times that amount. The installation used by the Eastern Dark Fired Tobacco Growers Association consists of a 300-kw boiler and a 10-hp motor for the air fan.

About two years ago The J. L. Sherill Co, Mayfield, Ky., built the first such plant, consisting of a 50-kw boiler for generating steam. It can condition about 12,000 lb a day. Both installations were designed by TVA electrical development engineers.

Operating objective is maintenance of air conditioning in the room at about 50% relative humidity and a dry-bulb temperature of 95F. Tobacco reaches the plant with about 22 to 25% moisture content which must be reduced to 17% or lower but not below 14% before tobacco may be packed into hogsheads for further handling. Conditioning each batch takes 4 hr.

Steam heat produced by the electric boiler can be used also for drying tobacco after it has been made into twist. An installation of a 140-kw boiler for producing steam for this purpose is under construction at R.C. Owen Co, Gallatin, Texas. Edward Freeman, The Tennessean, Nashville, Tenn.

Humidity Control Gives Added Cooling

Heat pump equipment of Wisconsin P&L official cuts humidity problem after control modification, improves utility load factor about 10%

GLYDEWELL BURDICK, Secretary, Wisconsin Power & Light Co, Madison, Wis.

The old saw, "It's not the heat, it's the humidity" has significance to people interested in air conditioning.

Humidity control is as important to the comfort of air conditioning equipment users as temperature control. This became evident after installation in 1955 of humidity control on my home's heat pump equipment (EW, Nov. 15, 1954, p 132). The modification provides cooling and/or dehumidification as varying weather requires.

Heat Pump Usage Rises

The figures in Table I show that heat pump equipment operated longer hours after humidity control was added. There was more than a proportionate increase, though, in the Burdick family's comfort, especially in sleeping. In our region, as in much of the country, nighttime temperatures frequently dip below the cooling equipment thermostat's temperature setting. An invariable rise in humidity, often from 70% to 100%, caused discomfort before the modification of the equipment.

Controls Good Sales Tool

Without increase in capacity, the addition of humidity controls probably would improve annual load factor for this area's air conditioning from a difficult 5% to 15%. The controls would provide convincing sales tools for prospects who have postponed air conditioning purchases for just such developments.

Low Humidity Ups Comfort

To meet comfort requirement goals 24 hours a day, a home's equipment should have capacity to maintain temperatures between 74F and 80F and relative humidity below 50%. This would be over the outdoor temperature range from 65F to 100F and absolute humidity of up to 100 grains of water vapor per pound of dry air.

(*Continued on page* 202)

Table I: Summer Air Conditioning Data

Heat Pump in the Burdick Residence, R-1, Waunakee, Wisconsin

(Equipped in 1955 to dehumidify with or without net cooling effect)

	1954* June 11-Sept. 7	1955** June 1-Aug. 31	July 1954	July 1955
Degree-day excess of man temperature above 70 F (DDE)	270	416	121	258
Absolute humidity excess (AHE) (sum of daily excess over 65 grains/lb air	1,644	1,653	655	1,071
Energy used Kwhr				
For cooling and dehumidification	620	1,715	339	1,020
Per DDE	2.30	4.12	2.80	3.95
For ventilation	50	131	25	54
Subtotal	670	1,846	364	1,074
Per DDE	2.48	4.44	3.01	4.16
Per AHE	0.41	1.12	0.56	1.00
For straight heating	none	180	none	1
Total energy used	670	2,026	364	1,075
No. of days house was closed for cooling/dehumidification	30	65	15	25
No. of hours in period	.....	1,848	744	744
No. of hours house was closed	NR	1,500 (2)	NR	611
Hours of air-coil operation	163	1,035	96	598
Air coil operation, % of hours closed	.....	69%	.....	98%
Hours of air circulation	NR	1,500 (2)	NR	611
Hours or reheat operation	(1)	771	(1)	290
Hours of reheat operation % of air-coil hours	.....	75%	.....	48%
Compressor hours, cooling & dehumid.	102.51	257.26	55.77	151.71
Compressor hours, cooling & dehumid. per AHE	.062	1.56	.085	.142

*Omits vacation Aug. 20–30, 1954

**Omits vacation Aug. 1–15, 1955

(1) Reheat installed in May 1955. In 1954 heat from other sources was tried in a small way

(2) Includes some straight heating.

NR—Indicates No record

Heat transfers: House air to air coil to 300 gal cold water storage to gas to 120-gal warm storage to well water rejection. Reheat from warm water storage to house air. Auxiliary heat pickup for limited straight heating without changeover, from 360-ft ground coil to cold water storage.

Table 2: Operation

Relation Room Temp. to Control	Relation Room Humidity to Control	Room Thermostat	Room Humidistat	Compressor and Fan* Operation	House Air Through Condenser
Below	Above	Closed	Closed	On	Yes
Below	Below	Closed	Open	Off	No
Above	Below	Open	Open	On	No
Above	Above	Open	Closed	On	No

*Fan in evaporator air circuit may be run continuously (manual switch) to maintain continuous circulation of house air.

Homes by the thousands are being equipped with GLASS PANEL HEATING!

And, no wonder! Look what you're offering when you promote glass panel heat with Ra-Grid® Heater Plates by Blue Ridge!

It's clean—No soot, fumes or smoke with radiant glass heat. Walls, draperies, rugs stay cleaner, which is part of the economy of electric heat . . . reduces cleaning bills, saves house cleaning.

It's convenient—The housewife has a constant source of fuel at her command . . . flip a switch or set a thermostat and, instantly, soothing heat!

It's efficient—With proper insulation and installation, glass panel heat with Ra-Grid Heater Plates is economical, too. Heat starts and ends within the area being heated, and it's paid for *after* it has been used.

It's adaptable—Glass panel heat is an easily expanded system, making it ideal for remodeling and new construction. Being glass, Ra-Grid Heater Plates fit into the decorative plan of every home.

It's the modern way to heat! Model homes, exhibits and consumer advertising have helped create interest in radiant glass panel heat.

RA-GRID HEATER PLATES ARE TIME-TESTED FOR PERFORMANCE AND SAFETY

Blue Ridge Glass Corporation, manufacturer of Ra-Grid Heater Plates for over 10 years, produces this high-tempered tough glass and fabricates it into the complete Heater Plate. The patterned glass has great resistance to thermal shock and impact, so is completely safe for homes with small children. You can rely on Heater Plates with "Ra-Grid" imprinted on each panel. Look for it.

MADE BY **BLUE RIDGE GLASS CORP.**
KINGSPORT, TENNESSEE

BLUE RIDGE GLASS CORP.®

PERFORMANCE REPORT ON AMERICA'S BEST SELLING TRUCKS:

"CHEVROLET SOLVED MOVING 1/3 MORE PAYLOAD

. . . says Mr. R. S. Bowie, President, R. S. Bowie Construction Co., Oklahoma City—a typical user of Chevrolet heavy-duty trucks.

"I truly believe that Series 8400 2½-ton Chevrolet trucks have solved my load problems. I have found that I am moving ⅓ more payload, *at the same cost*, than previously with smaller 2-ton trucks.

"I have owned and operated Chevrolet trucks for the past ten years but new Series 8400 models have, by far, exceeded my expectations. One of my 8403's is equipped with a hydraulic pole-hole digger and the other is pulling a trailer used to haul poles and to carry a bulldozer and air compressor."

Everywhere in America today, you'll find Chevrolet truck owners echoing Mr. Bowie's words . . . saying, in effect, "Chevy puts more money in my pocket!" A California truck user, for example, Mr. H. A. Roehling of Walters Electric, Los Angeles, states:

"For the past eight years we have been using Chevrolet trucks exclusively because of their

CHEVROLET **NEW CHEVROLET**

Anything less is an

MY LOAD PROBLEMS . . . I AM AT THE SAME COST!"

exceptional economy in both operation and upkeep. From our experience, we have found that no other truck on the road requires less maintenance and delivers more miles per gallon. As for dependability, they haven't let us down yet. We have never experienced time lost on any job due to a Chevrolet breakdown. This, too, is good business, and makes for good customer relations."

Reports such as these offer proof of the low-cost, high-powered performance a new Chevrolet truck will bring to *your* operation. Why not see your Chevrolet dealer soon? . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

***Modern features* make new Chevrolet trucks the Performance Champs of Every Weight Class!**

- **New** high-powered V8's with moneysaving short-stroke design!*
- **Extra high-compression 6's**—the world's most popular truck engines!
- **Great** automatic transmissions† available for whichever Chevy truck you choose!
- **New** tubeless tires for bigger payloads and safer, more dependable operation, standard on all models!

**Optional at extra cost, Series 3000, 4000, 6000 models.*
†Optional, extra cost.

TASK·FORCE TRUCKS

old-fashioned truck!

Humidity Control Cools

(*Continued from page* 198)

To accomplish this the equipment should:

1. Maintain air circulation all the time house is closed.
2. Cool and dehumidify at a 72F to 67F temperature range.
3. Cool, dehumidify, and reheat (humidity control without reduction of room temperature below 67F).
4. Have adequate fresh air intake and house air outlets.
5. Provide almost constant heat removal from the house at a rate approximating the time-to-time total heat gain.
6. Maintain a noise level in the living room and bedrooms not exceed 40 decibels.

It would also be desirable if the system provided heat to meet requirements for outdoor temperatures down to 50F. The best available air cleaning equipment would prevent dust circulation in the air.

A diagram of air ducts and dampers for such a system is shown in Fig 1. Wiring controls are shown in Fig 2. Sequence of operation for the system is shown in Table 2.

The extension of such equipment would make air conditioning doubly attractive to many customers who are bothered more by high humidity than by high temperatures.

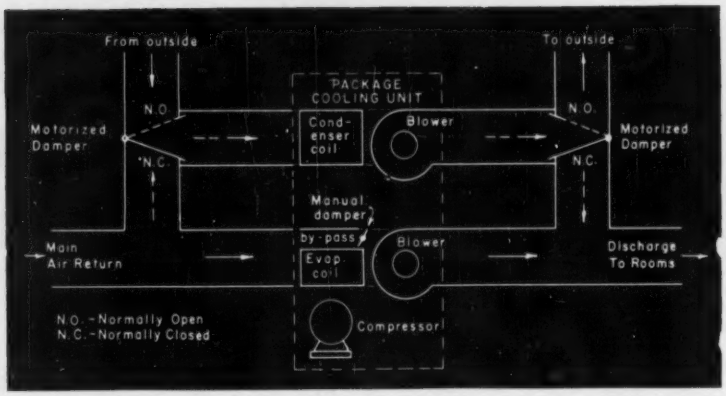


FIG 1—HUMIDITY CONTROL with and without cooling is provided by this system of ducts and dampers. This diagram applies only where air-to-air unit is used

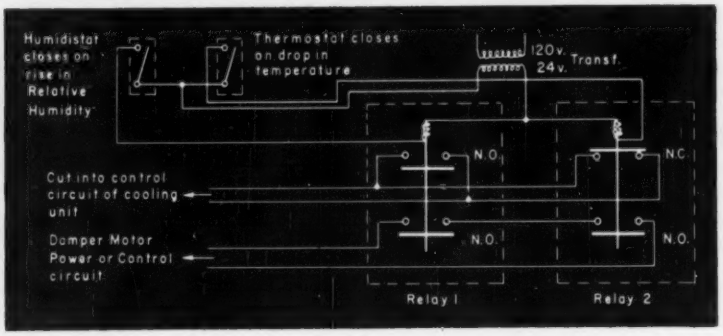


FIG 2—AIR-TO-AIR unit which will provide continuous humidity for a residence as well as temperature control may have a wiring diagram like that above

Simplified Definition Urged for Air Conditioning's Role

To help the public recognize air conditioning's year-round part in providing comfort, members of American Society of Heating & Air-Conditioning Engineers are promoting this simplified definition of just what air conditioning is.

"Air conditioning," it says, "is the process of treating air so as to control its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space."

Skyscrapers Save Time, $ With Electronic Controls

A trend toward electronic control centers in big buildings will save ". . . thousands of steps and hundreds of man hours." So says Charles Saunders, Minneapolis-Honeywell Regulator Co, who views the development as akin to new industrial techniques.

Sanders told American Society of Heating and Air Conditioning Engineers' Arkansas chapter that work on electronic centers is bringing automatic control of lighting, elevators, building security, and materials handling in addition to climate conditioning. Techniques now used in more automated industries ". . . would need but slight modification to make them suitable to the . . . operation of an office, factory, hotel or similar structure, he asserted.

Cites Heating Potential

Electric house heating is getting nods of recognition from industrialists outside the electric industry. David G. Hill, president of Pittsburgh Plate Glass Co, told a recent meeting of the Plate Glass Jobbers Association that as electricity became cheaper in cost in relation to other fuels, heating by means of glass panels would, as he put it, become very popular.

7 Million Fans This Year?

Electric fan production this year will hit 7 million units, predicts R. O. Fickes, general manager of General Electric Co's automatic blanket and fan department. To operate, these fans will require more than a quarter billion kwhr annually.

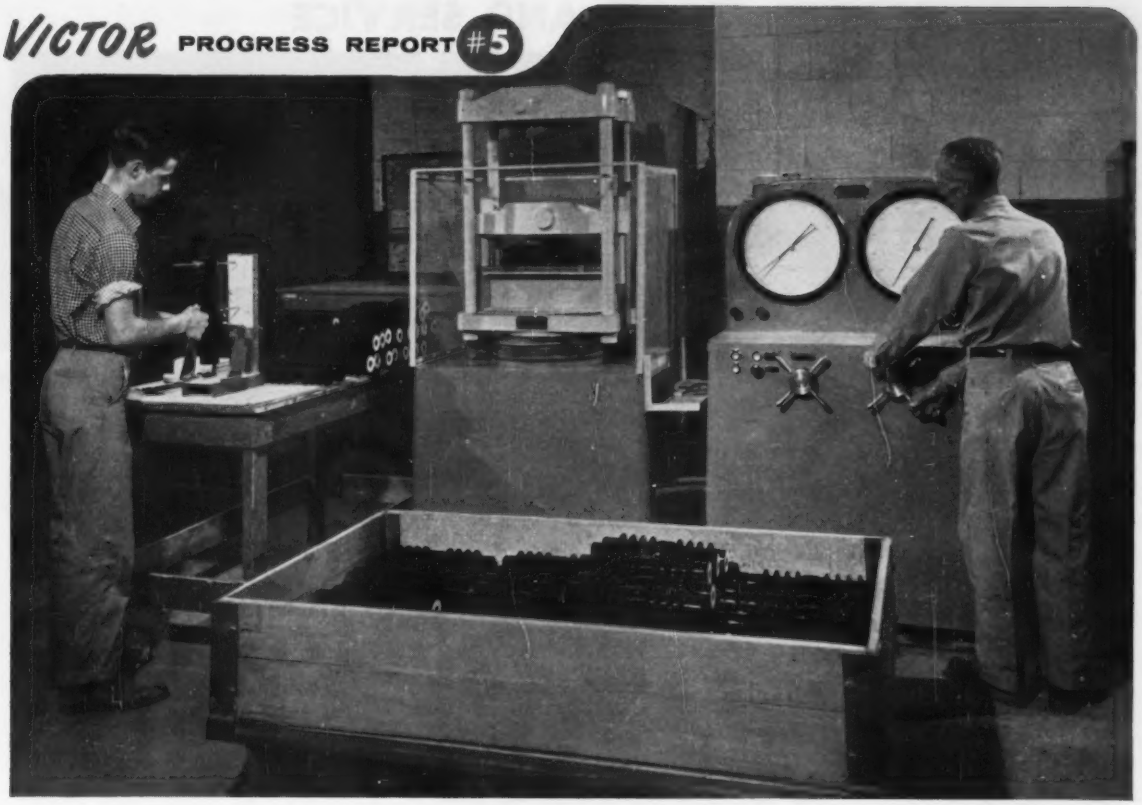
Ranges, Heaters Bust Quotas

Electric water heater sales went 46% over quota and ranges 14% in two-month "Spring Swing" campaign recently completed by Florida Power Corp and Georgia Power & Light Co. Water heater sales hit 3,644, 56% above the same period last year, while range sales went to 2,846, a gain of 34%.

Thermostat Gives Close Control

Electrend Products has incorporated new thermostat said to maintain a min of ½ F temperature differential to its line of forced air heating systems.

VICTOR PROGRESS REPORT #5

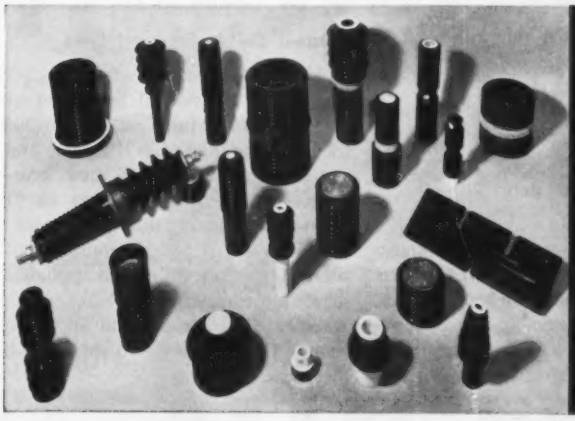


VICTOR
PURIFIED PORCELAIN

the Industry's standard for Special Shapes!

The hydraulic testing machine shown above is located in Victor's special porcelain testing department. Insulators such as these open cutouts are given a calculated transverse load before electrical test. The inspector on the left is checking hole alignment.

Starting with *Purified* Porcelain—finest insulator porcelain ever made—all special shapes made by VICTOR undergo rigid quality controls, tests and inspections to assure users of the best insulating materials money can buy. If you need special shapes required in cutouts, circuit breakers, potheads, capacitors, switchgear, transformers and other electrical equipment, choose the best! Choose VICTOR!



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Purified Porcelain Insulators!

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VICTOR INSULATORS DIVISION
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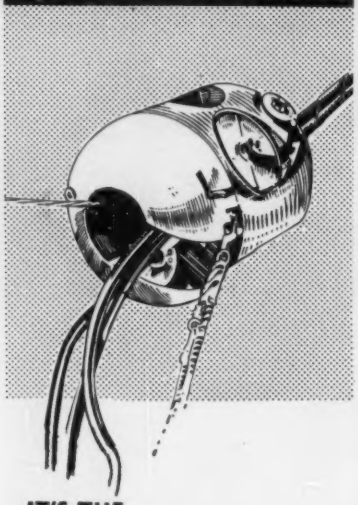
THREE TO ONE



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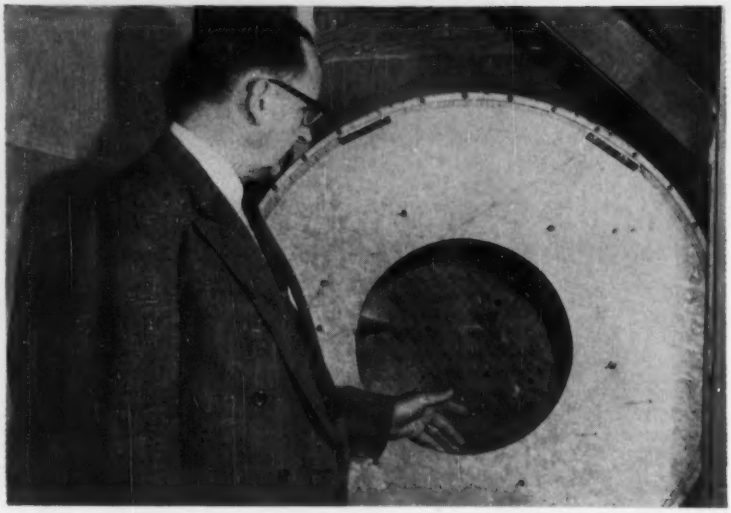

1935 Granddaddy of Electric Dryers

When you talk about new developments in electric clothes dryers to Wes De Maris, Tacoma (Wash.) City Light employee, you'll have to pardon his slightly smug chuckle. It was 19 years ago that he built this model in his basement, long before Madame Housewife could buy them.

The device, hardly noticeable except for the round window, consists of a 48-in. galvanized iron drum driven by a ¼-hp motor and the salvaged mechanisms of a 1925 Graybar washing machine. Filtered warm air from the furnace enters through a 6-in. blower and is spent through an outside exhaust. De Maris is superintendent of distribution and transmission for the municipally-owned Tacoma system.

S&S SHORTS

New Orleans Housewares Double

A 100.7% jump in sales of small appliances was rung up by New Orleans Public Service, Inc., during a two-month "Safari" campaign March through May. Dealer and distributor sales leaders were awarded a total $1,100 in cash prizes plus 20 merchandise prizes at a buffet dinner following the campaign. More than 16,000 sales were made.

"High-Low" Bulb Ready

A new three-way light bulb—30-200-230 w—is now being marketed nationally by General Electric Co after tests in the Detroit, Chicago, and Albany areas. Surveys in these communities revealed a marked preference for the new bulb over the present 50-100-150 w three-way bulbs, says G. E. People liked the 30-w level for televiewing and night lighting, the 200 and 230-w levels for reading, studying, and sewing. Bulb carries a list price of 65¢.

Contest Builds Prospect Lists

About $1¼ million worth of electric ranges are wanted by customers of Sacramento Municipal Utility District, and the utility has the name and address of every one of these prospects. Each year it conducts an "I Want An Electric Range" contest. (EW, May 7, p 59.) Entrants, competing for prizes, fill out an appliance survey on their contest blanks which are then turned in at local appliance stores. Data is tabulated on a card,

(*More S & S on page* 209)

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Distribution Transformers .....

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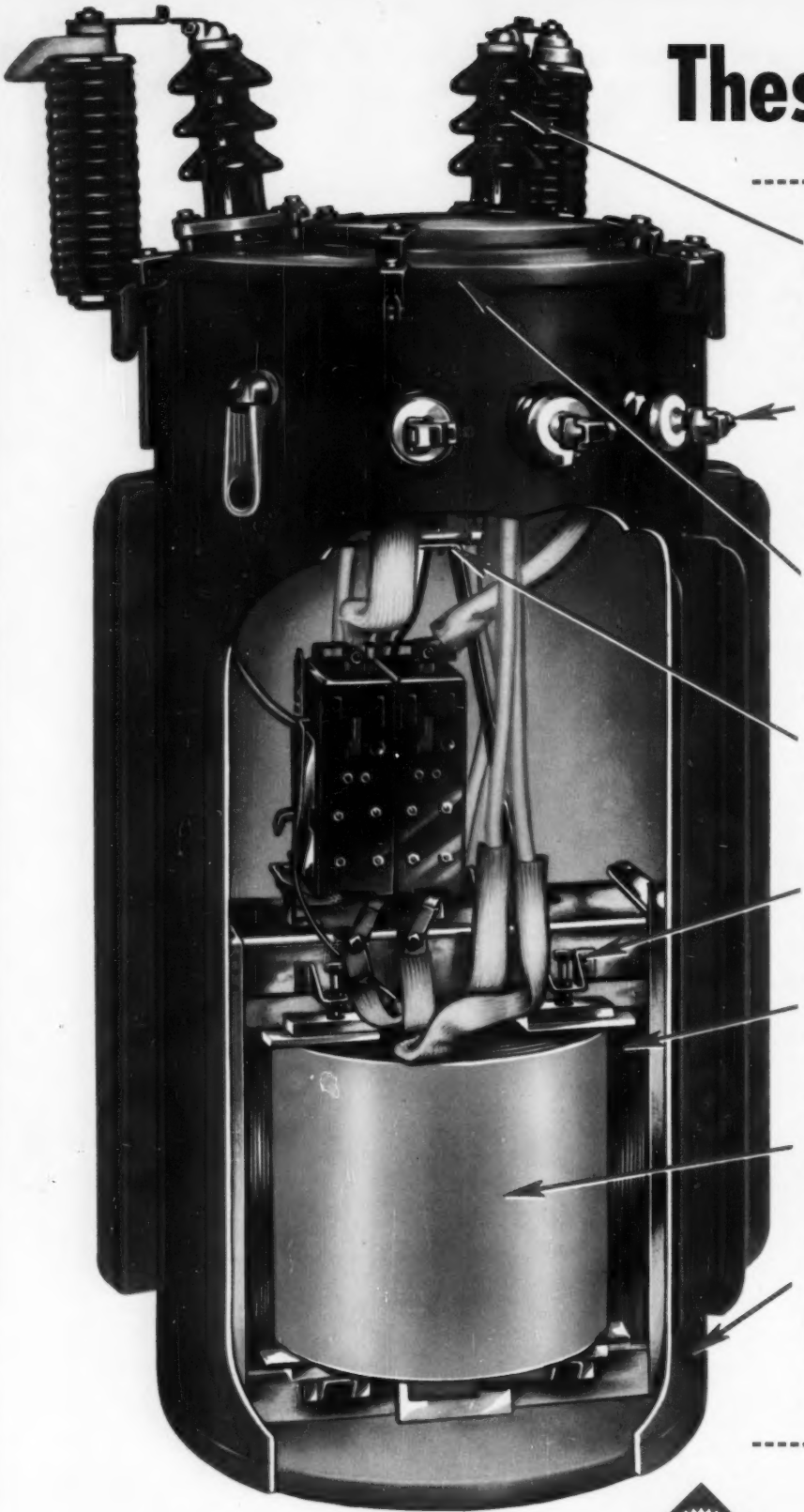

Time-saving, easy-connecting high voltage bushing accommodates any EEI-NEMA conductor size. Bushing is radio-interference free. Terminal assembly keyed to porcelain to prevent gasket movement or shearing.

Double-keyed low voltage bushing gives positive protection against rotation, eliminates possibility of internal short circuit. Corprene gaskets are fully retained . . . are compressed without twist or shear. Tinned clamp-type connectors permit use of either copper or aluminum.

Precision-fitted, positive-seal cover is oil and air tight. Tank is effectively sealed with permanent type, fully retained gasket. Captive cover clamps save time, too — they can't fall to the ground during inspection or periodic maintenance.

Easy-to-read indicator plate marks tap-changer position. Operating handle and indicating plate are well above oil level. Porcelain base increases dielectric strength and tracking resistance.

Adjustable-type coil supports lock coil firmly and safely into position. Pads under support are specially compounded for strength, give even clamping over coil width.

Low losses . . . low exciting current . . . improved regulation with compact *Curvacore* construction. High quality, preferred oriented cold-rolled core steel is used. Core loops are carefully matched.

Oven-dried assembly insures low insulation power factor. Each coil is thoroughly dried and then tanked while still hot to prevent moisture penetration.

Machine-welded, heavy gauge sheet steel tank is made to be as maintenance-free as possible. Tank bottom is recessed with straight wall construction inside and out — no place for condensation or water to collect.

Curvacore is an Allis-Chalmers trademark.

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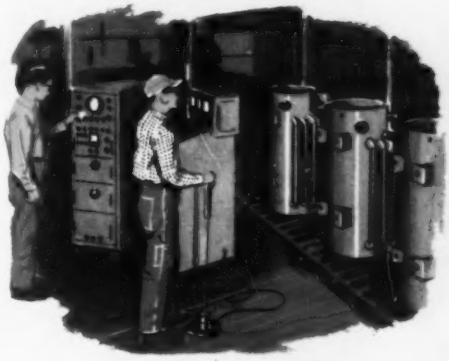
Features Make Allis-Chalmers Your Best Transformer Buy

Controlled Quality Means MORE Transformer Value

Production checks assure quality throughout Allis-Chalmers distribution transformers. From the heart of the transformer — the core steel — to the bushing terminal cast connectors which receive a severe mercurous nitrate test, all component parts are carefully inspected and tested.

Mechanical inspection and electrical tests are conducted at various stations along the production line to maintain rigid engineering specifications.

Even the thickness of paint is measured under the Allis-Chalmers Quality Control Program. Exclusive hot-spray paint process insures long paint life with minimum maintenance.



Production line impulse testing is one of the final steps in Allis-Chalmers Quality Control. Regardless of size or voltage, every Allis-Chalmers distribution transformer brings you this seal of quality.

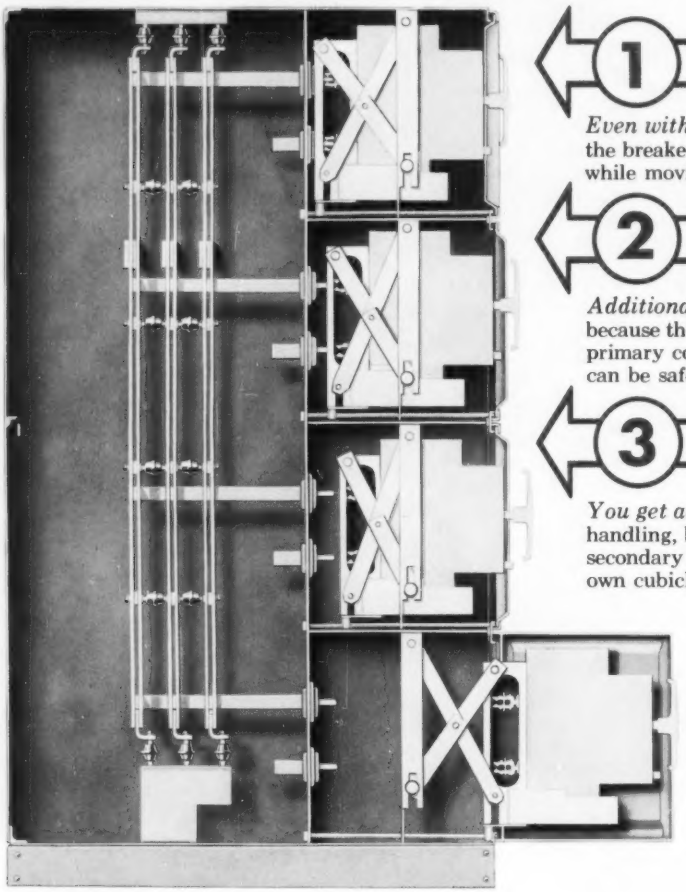
SEE FOR YOURSELF

All the features and advantages of Allis-Chalmers distribution transformers are graphically, conveniently explained with the Allis-Chalmers "Visualizer." Call your nearby A-C district office and ask to see it. Or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for complete information.

CHALMERS

Positive Protection for YOUR Personnel

Get the Low Voltage Switchgear that's Fully Enclosed in ALL 3 POSITIONS



1 OPERATING POSITION

Even with the door open, dead-front construction of the breaker means complete safety for your personnel while moving breaker in or out of operating position.

2 TEST POSITION

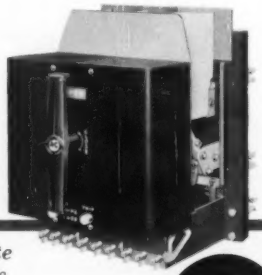
Additional protection for your personnel is assured because the breaker can be moved to test position with primary contacts disconnected, and breaker operation can be safely checked with compartment door closed.

3 DISCONNECTED POSITION

You get added convenience — save storage space and handling, because the breaker, with both primary and secondary contacts disconnected, can be stored in its own cubicle with the door closed.

Inspection also is simplified. In the fully withdrawn position the primary and secondary contacts are clearly visible for inspection without removing the breaker from the cubicle — and it's all done with a convenient, reversible door panel and a rigid, positive-positioning pantograph mechanism.

The breaker provides new flexibility. Long time, short time and instantaneous tripping devices are available. Each is adjustable independently of the other. Selective trip feature available initially or may be added later. Time delay device is sealed, positive displacement type for accuracy. An unusual feature of this new breaker is the faulted phase indicator which tells your operator at a glance on which phase fault occurred. Breaker is dead-front for safety of personnel.



Get more information. Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-5055

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Signs along the lines of Crapo GALVANIZED STEEL STRAND PERFORMANCE
For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.
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• Contact your Crapo Jobber—Today!
INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

More S&S Shorts

(*Continued from page* 204)

coded according to the appliance store's imprint on the entry blank, and then turned over to dealers as prospect lists. This year's contest pulled nearly 3,000 entries.

Free Power For Range Buyers

Southwest Louisianan Electric Membership Corp, Lafayette, La., is giving new electric range buyers a $12 credit on their electric bills plus up to $25 for the wiring installation.

Farm Equipment Directory Issued

Industry's first "Directory of Manufacturers of Electric Farm Equipment" has been published by the Farm and Rural Market Development Committee of the National Electrical Manufacturers Association. Volume lists makers' names and addresses in alphabetical order and by product. Price is 30¢ per copy, 18¢ each for orders of 10 to 99, 16¢ in quantities of 100 to 999, 14¢ for 1,000 or more. Order from NEMA, 155 E. 44th St., New York 17, N. Y.

Dryer Sales Ideas

Collection of clothes dryer sales ideas for dealers and utilities are contained in "Dryer Tips," now being distributed by American Home Laundry Manufacturers Association. Samples: Dryer rental plan; free home trial plan; free installation, extended credit plan and rainy days sale. More unconventional sales gimmicks include a clothesline trade-in offer in which a stipulated trade-in value is placed on the homemaker's clothesline and clothespins on purchase of dryer.

New Wrinkles:

An electric hairbrush said to provide 5,000 "push-pull" strokes per minute has been added by Corp Corp to its housewares line . . . Piped music throughout the home is now possible via a system which feeds sound from record player, TV or radio into the warm air heating system of the home. Installation consists of a wire run from the music source to an electronic speaker attached to the plenum chamber or dome of warm air heating system or to air conditioning ducts. It's marketed by Alsto Corp, Cleveland.

Design makes the difference!

Gar Wood winches outperform every other make . . . give you greater safety . . . *yet require only half the maintenance!* Here's why:

- ***Aluminum housing can't rust.*** You get corrosion-free operation in all climates, under all weather conditions. And, aluminum means less weight, more payload, faster heat dissipation.
- ***Ball bearing worm shaft.*** Self-contained Ball Thrust Bearings never need adjustment.
- ***Fully-enclosed clutch.*** Protected against dirt and weather, clutch can't stick or freeze—ever!
- ***Bonded brake lining.*** Provides longer life, increased braking area.
- ***All moving parts run in oil.*** Smooth, trouble-free operation.

There's a Gar Wood winch for every job . . . for every size truck. Call your Gar Wood-St. Paul truck equipment distributor for specifications of the world's most advanced line of winches. Or, mail coupon below.

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Gar Wood Industries, Inc., Wayne, Michigan
Please send me the new, free booklet W-183 that illustrates the complete line of Gar Wood winches.
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dependable service under all operating conditions

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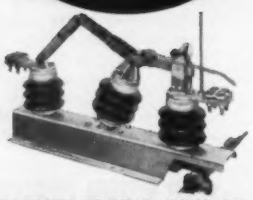
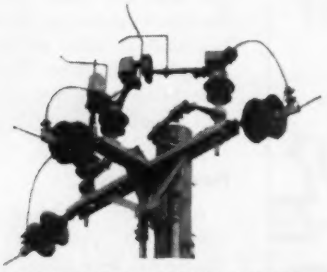
At KEARNEY, product pioneering thrives on meeting tough new challenges. It's always been this way.

KEARNEY brought to the industry such products as the By-Pass Disconnect, which does the work of three single throw disconnects . . . the exclusive *Automatic Reclosing* Secondary Breaker . . . the first split-bolt connectors . . . Squeezons, the first compression connectors . . . the exclusive design of Tripomatic fuse cutouts . . . and many others.

Product pioneering, however, is a two-way street. And we never forget it. KEARNEY's reputation rests on the fact that it has always worked so closely with its customers . . . and planned with them for the years ahead.



KEARNEY TILTING INSULATOR GROUP OPERATED SWITCH



KEARNEY THREE-POINT SWITCH

KEARNEY REGULATOR BY-PASS DISCONNECT

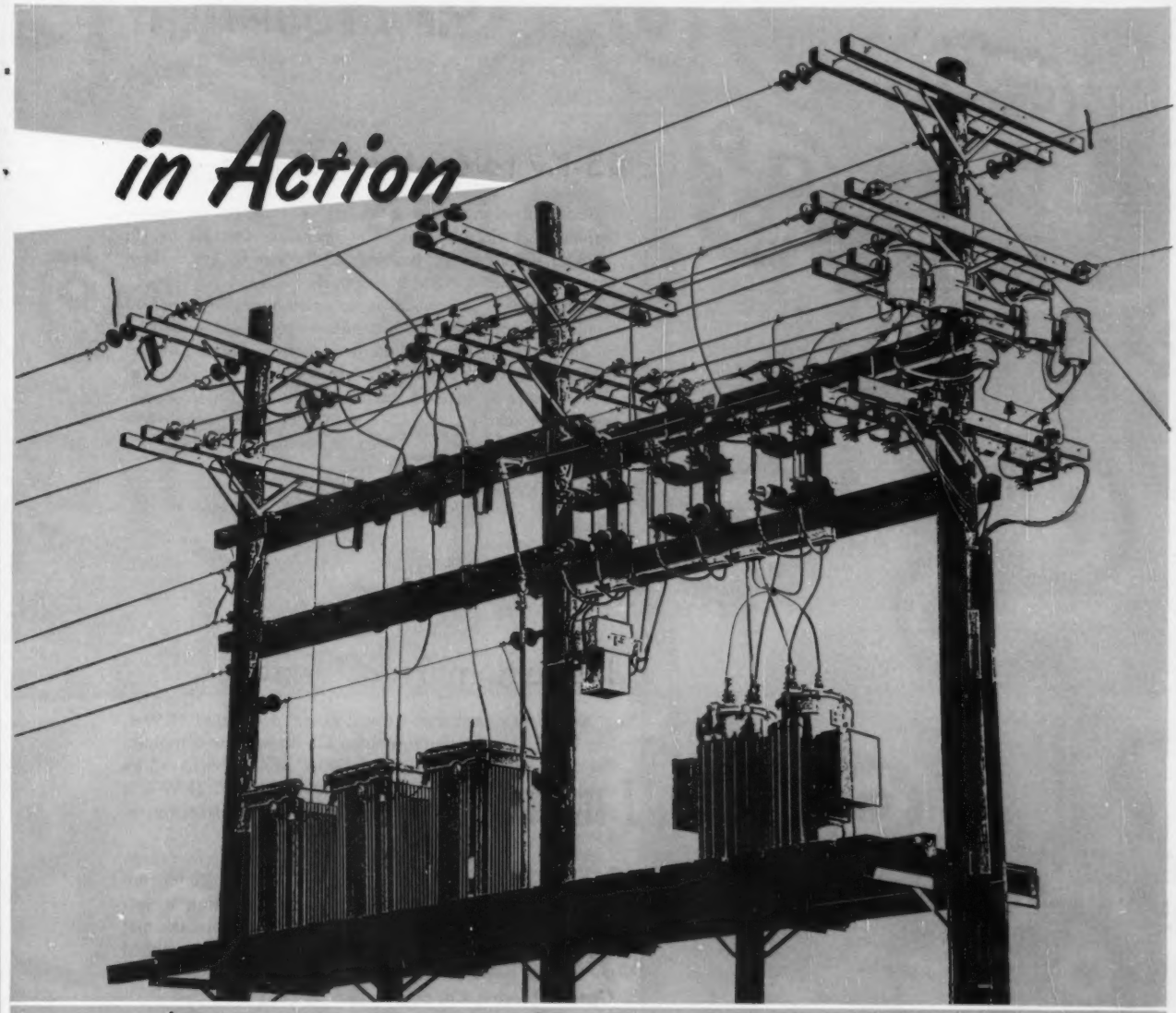
for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

KEARNEY PRODUCTS

The Mark of Quality

in Action



KEARNEY
SINGLE THROW
DISCONNECT

KEARNEY
DOUBLE THROW
DISCONNECT

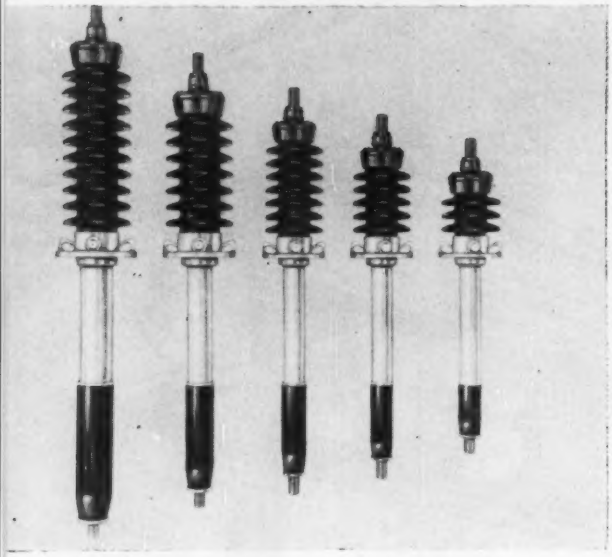
KEARNEY
TANDEM
TRANSFER

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

Canadian Plant: Guelph, Ontario

JRK-340



15-Kv to 69-Kv Bushings

Series of high-voltage bushings is designed for transformers and circuit breakers at operating voltages of 15, 23, 34.5, 46 and 69 kv. Bushings 23 through 69 kv conform with current ASA-NEMA standards.

This series is described as completely sealed paper-oil condenser type design with condenser core surrounded by oil and enclosed in porcelain-metal housing. Spring-loaded gaskets seal the assembly and protect the bushing. Unexposed core is covered, below aluminum ground sleeve, with non-tracking porcelain housing. Features include low power factor, radio and TV interference free, and non-changing in storage or in service.

Lapp Insulator Co, Inc, Leroy, N. Y.

Instrument Transformers

An 8,700-v instrument transformer, designated JKW-4, has been added to butyl-molded CT line. This completes the line, which ranges from 600-v miniature to 15-kv outdoor model. Designed for outdoor service, JKW-4 is reportedly about half the size and weight of its predecessor models.

Available in all standard single-primary current ratings 10 to 800 amp inclusive, JKW-4 has single 5-amp secondary. Transformer is said to provide accurate metering down to 5% of rating and up to continuous thermal limit. It can be bolted directly to a crossarm or attached by U-bolts or suspension hooks.

General Electric Co, Schenectady 5, N. Y.

Earth-Boring Machine

A truck-mounted earth-boring machine with hydraulic turntable base and swivel action is said to permit operation at any angle over full 180-deg arc without moving the truck. Hydraulic extension action also reportedly gives machine an extra 22-in. reach within its operational radius.

Digging capacity is 9 to 36-in. diam holes and depths up to 10 ft. Earth borer can set from 40 to 45-ft poles, weighing 2,000 to 2,500 lb, by attaching integral winch and derrick. Telescoping derrick with 3,500-lb capacity is optional. "Swing-base" unit can be mounted on single-rear axle or tandem truck.

Highway Trailer Co, Edgerton, Wis.

(*More New Equipment on page* 216)

HAPCO Aluminum Lighting Standards ...the choice of modern shopping centers for beauty...strength...economy

HAPCO Tapered Aluminum Poles and Lighting Brackets are the choice for many modern shopping centers because of their day and night attractiveness, structural strength, economy of erection and maintenance. The silver-grey, Venetian column design blends with the most modern architecture and either meets or exceeds accepted industry structural standards. No initial painting or subsequent maintenance of lightweight HAPCO Aluminum Poles means substantial savings in handling, transportation and erection.

HAPCO Aluminum Standards are particularly well suited for heavy industrial and seacoast areas with corrosive atmospheres. In addition, aluminum is highly resistant to calcium chloride compounds widely used in northern areas for winter maintenance of streets and parking areas.

Among the complete line of HAPCO Aluminum Lighting Standards is a HAPCO Pole with Bracket design to best meet *your* outdoor lighting requirements.

FREE CATALOG

For design specifications, general information and installation views of HAPCO street and flood lighting standards, special purpose poles, pedestals, brackets and accessories, write today for Catalog HAL 754. This booklet contains many ideas and helpful information to aid you in planning modern outdoor lighting for a variety of conditions.

HUBBARD ALUMINUM PRODUCTS COMPANY

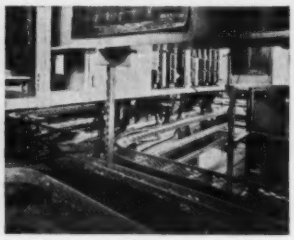
Division of Hubbard & Company

Pittsburgh 1, Pa.

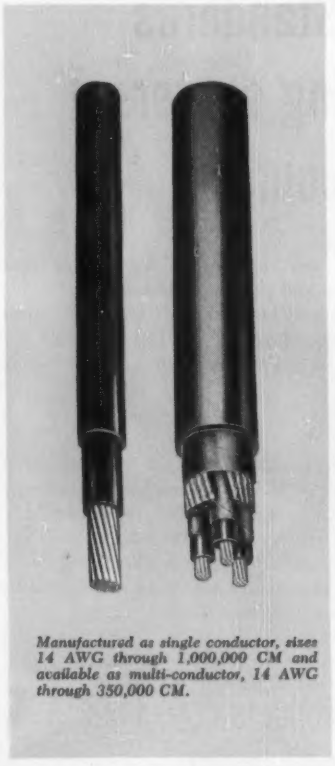
For residential and rural electrification, RoMarine-RoPrene is the answer for service entrance as well as branch circuits between buildings.

Several miles of single-conductor, RoMarine-RoPrene street lighting cable was recently installed at Redwood Falls, Minnesota. This cable was installed underground in ducts. Insert shows completed lighting installation.

Consolidated Edison (and other leading utilities) uses RoMarine-RoPrene for its vast underground power cable secondary network in New York City.



Where you install cable in racks, trays or metal raceways, specify RoMarine-RoPrene. Its light weight and smaller diameters will make your job easier.



Manufactured as single conductor, sizes 14 AWG through 1,000,000 CM and available as multi-conductor, 14 AWG through 350,000 CM.

To light the Ft. Worth International Airport, 55 miles of CAA approved RoMarine-RoPrene single-conductor cable (rated at 3000 volts) was buried directly in earth.

One all-purpose

If you are one who has anything to do with the distribution of low-voltage power—underground, aerially, in ducts or in circuits combining all three—this is for you!

RoMarine-RoPrene is an all-purpose nonmetallic sheath power cable you can use for street lighting, power cable networks, airport lighting, utility, industrial or commercial power distribution, residential services and rural electrification.

This product of Rome research and engineering has proved its superiority in so many ways you can bank on it without reservation.

RoMarine is a high-quality heat- and moisture-resistant insulation (RH-RW) exhibiting exceptional electrical stability after long-time immersion in water together with excellent long-life aging characteristics. RoMarine conforms to all requirements of ASTM Specification D754-54T, plus the additional moisture absorption tests as specified by

cable for all these applications!

Underwriters and IPCEA Appendix N.

RoPrene is a tough, impervious Neoprene sheath fitting tightly to the insulation and possessing a high degree of resistance to oxidation, heat, flame, weather, oil and most chemicals. RoPrene conforms in all respects to ASTM Specification D752 and Grade I of IPCEA, Appendix K.

RoMarine-RoPrene is available in two distinct types with respect to application and operation, namely, Style RR and Style RR-D.

RoMarine-RoPrene approvals

- RoMarine-RoPrene, Style RR.

This is Rome Cable's standard product, manufactured with sheath thicknesses suitable for *direct earth burial*, and is equally suitable for use in conduit or duct, as well as aerial installation where greater protection against cable rings or binding wires is desired. It is Underwriters' approved as Type USE for underground service entrances and is so labelled and surface marked.

- RoMarine-RoPrene, Style RR-D.

This type construction is offered for use in ducts or underground conduits as an economical power cable manufactured with the same high-quality insulation, but with lighter sheath thicknesses. While approved by Underwriters' Laboratories Inc. and identified as Type RW (60°C.)–Type RH (75°C.), this construction *is not recommended for direct earth burial.*

CAA Specification L-824

RoMarine-RoPrene, Style RR is approved by the Civil Aeronautics Administration for airport wiring when CAA Specification L-824, with Type A insulation applies.

Check these RoMarine-RoPrene advantages:

When you specify RoMarine-RoPrene you get the double protection of a superaging, heat- and moisture-resistant insulation . . . and an all-resistant Neoprene sheath. *Plus these advantages . . .*

- Easy to splice and tap
- Good resistance to overloads
- Light weight and small diameters
- No braids or fibrous coverings to rot
- Unaffected by electrolysis, corrosion and weather exposure
- Resists oils, heat, sunlight, flame, moisture, abrasion, as well as soil alkalies and acids
- You save in installation costs
- You reduce inventory

For more detailed specifications, write for Bulletin RR-2.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

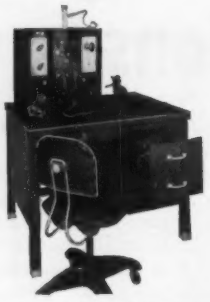
STATES TESTING EQUIPMENT

Testing accuracy. Testing ease. Testing economy—That's what you can expect and receive from dependable States Testing Equipment.

"FRD" with photo electric control. Also "FASD" which is similar design for automatic sequence testing.

PHASE SHIFTER TYPE R

Made in 50 to 2500 volt ampere capacities. Provides means for shifting phase continuously for every possible angular displacement. May be obtained as combination of phase shifter and induction regulator.



Form "FHAPBL"

A compact table for testing single phase and polyphase watthour meters. May be furnished with or without photo electric control. Optional desk foundation 40" wide. Fully equipped for all around watthour meter testing.

THE STATES COMPANY

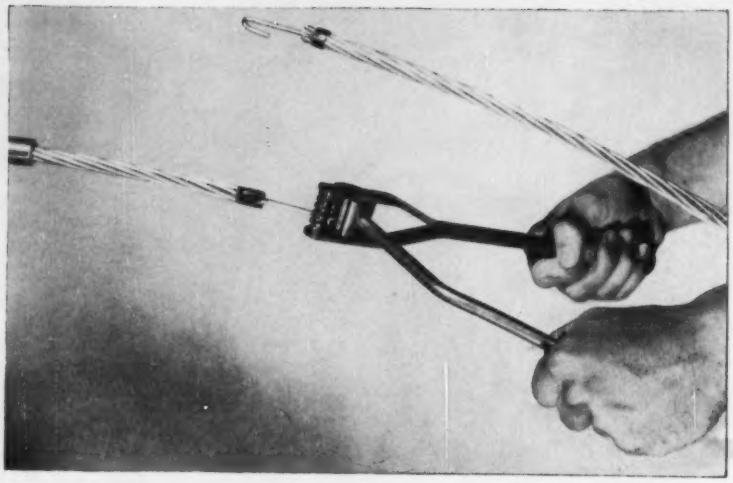
THE STATES COMPANY
19 New Park Ave., Hartford, Conn.

Please send me further information on
☐ Test Tables ☐ Phase Shifters

Name..... Title.....

Firm Name.....

City ..... Zone.... State.....



Single Core ACSR Joining Tool

A 1½-lb tool reportedly makes possible a quick, simple, cost-cutting technique for joining single core ACSR, No. 6 to 2/0 sizes inclusive, and other conductors with similar core sizes.

The plier-like tool forms hooks in steel core of sub-transmission and distribution ACSR. Cores are then hooked together and clinched. Next, an aluminum sleeve is centered over joint and compressed, completing a connection with minimum conductor strength of 95% and offering low electrical resistance.

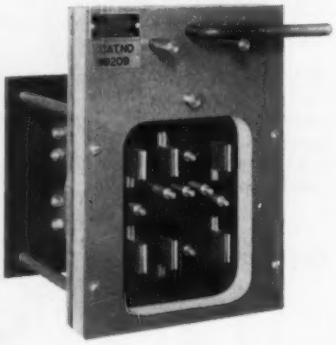
Aluminum Co of America, Alcoa Building, Pittsburgh 19, Pa.

Bus Clamps, Fittings

Line of outdoor bus support clamps and fittings for cable, tubing or bus bar is available for 3-in. bolt circle, standard strength, or 5-in. bolt circle, high strength insulator mounting. Line accommodates No. 1 to 2,000-Mcm cable, ½ to 2½-in. IPS tubing, and 2 to 6-in. wide bus bars.

Range of cable sizes can be handled by clamp with two similar parts, so only one part need be stocked.

Line Material Co, Milwaukee, Wis.



Meter Connection

This 200-amp meter connection, designated Quick Contactor, accommodates single phase and polyphase socket meters, manufacturer reports.

It is made in three styles to take regular socket or "banjo" type socket polyphase meters. Features include positive acting and gripping action. The Contactor is mounted on a panel section in photo at left.

States Co, Hartford, Conn.

(*More New Equipment on page* 220)

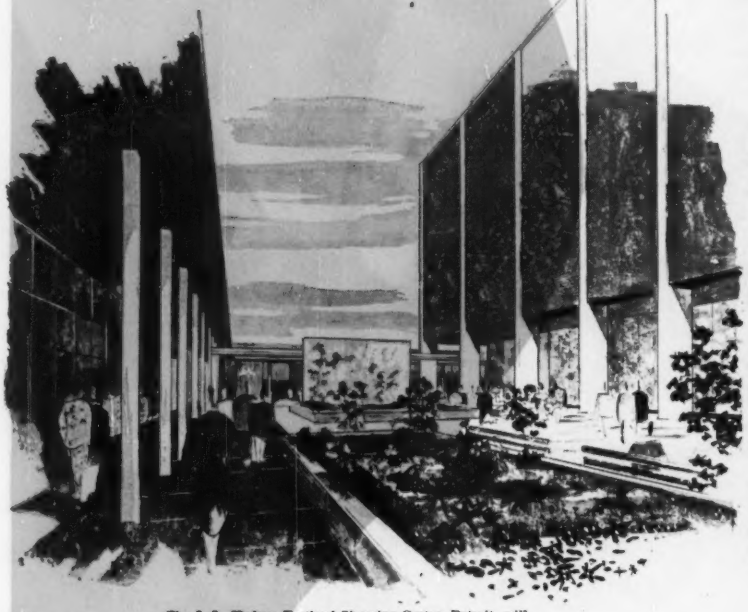
NO DOUBT ABOUT IT . . SO PITTSBURGH STANDARD CONDUIT THREADS ARE HOT-DIP GALVANIZED

Cost for rigid steel conduit must be measured by both purchase price *and* labor cost for putting the conduit in place. If workmen's time must be spent in chasing rust from threads, then you pay more—make less on the job. That's the reason Pittsburgh Standard gives you hot-dip galvanized threads on hot-dip galvanized conduit *on every size through 6-inches*. And because Pittsburgh Standard owns the world's most modern conduit mill, these hot-dip galvanized threads come to you *at absolutely no extra cost*. This is a major advance—company after company is rewriting specifications to call for Pittsburgh Standard Conduit. Available from your Pittsburgh Standard wholesaler, or write *Pittsburgh Standard Conduit Co., 61 Bridge St., Pittsburgh 23, Pa.*

PLANTS AT MORRISVILLE & ETNA, PA.

RIGID STEEL CONDUIT • ELECTRICAL METALLIC TUBING • ELBOWS • COUPLINGS • FITTINGS

Another TRIANGLE Multiple Product Job



The J. L. Hudson Eastland Shopping Center, Detroit, will cover 950,000 square feet. It was designed by Victor D. Gruen Associates, Detroit. Hyde & Bobbio, Inc., are the Mechanical and Electrical Engineers and the Electrical Contractor is John H. Busby Co., Detroit.

J. L. Hudson builds $28,000,000 Shopping Center

The Motor City is getting a new look. The new $28,000,000 J. L. Hudson Eastland Shopping Center will soon be open to provide luxury shopping facilities for busy Detroiters.

When completed, the new Center will have space for seventy stores and parking room for 5,000 cars.

The Center is a masterpiece of modern design and development. It is scheduled for opening in 1957. All stores will be completely Air Conditioned and the grounds surrounding them will be beautifully landscaped.

TRIANGLE ordered for the job

Naturally, such a development called for extensive wiring—flexible and rigid conduit, cable and building wire. And the contractor knew just where to get it. Triangle!

That's because Triangle is famous for the finest quality products that research and modern equipment can produce. And at Triangle the engineers knew they could get everything they needed—*when* they needed it.

The entire job was serviced through a nationally recognized distributor. Triangle is nationally distributed and representatives are located in principal cities in the United States. For your next installation, you'll find it pays to call Triangle.

927,000′ of TRIANGLE Wire and Cable 346,000′ of Rigid and Thin Wall Conduit... 32,000′ of Plastic Conduit...

for the new J. L. Hudson Eastland Shopping Center

That's how much top-quality electrical material will go into this new luxury shopping Center.

Seems like a lot, but not by Triangle standards—they are accustomed to filling big multiple product orders, *and on time!* Modern equipment, strict supervision and skilled workmen guarantee that. And that's why Triangle is considered one of the top companies—the men who specify know "it must be right" if it's Triangle.

Let's take a Quick Look at TRIANGLE

Up to date research

Ever expanding plants

Large stocks in redistribution centers

the Triangle trademark your guarantee of distinctive quality

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE
"IT MUST BE RIGHT!"

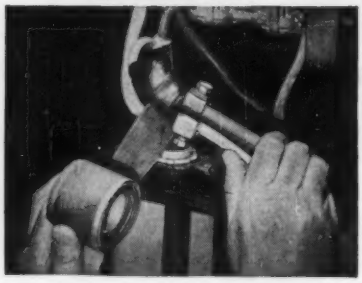
TRIANGLE

Conduit and Cable Co., Inc.

NEW BRUNSWICK, NEW JERSEY

Volseal...

the new high dielectric putty...



makes sealing easier!

New Johns-Manville Volseal is a high dielectric putty designed for sealing heavy cables and irregularly shaped objects. It has a dielectric of 445 vpm, together with excellent physical properties. Resists acids and alkalis, weathers well, is highly resistant to water, does not corrode metals.

Volseal also offers easy application. It is highly elastic, provides good adhesion, hardens within 3 hours on air curing. Available in extruded beads, ribbons and pugs. For complete details on Volseal and its new companion product Napseal, the petroleum resistant sealing compound, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JM PRODUCTS

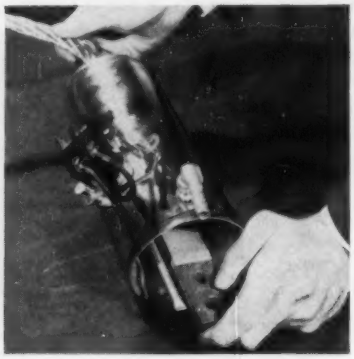
Johns-Manville
SEALING COMPOUNDS

Plastic Aerial Cable Bolt

A molded plastic bolt is designed for use in assembling all of manufacturer's aerial cable clamps-vertical, Tri-3 and Tri-6. Simplicity of installation is said to eliminate need for wrenches, sleeves and washers.

Small wings on bolt head and nut provide grip for bare or gloved hands and bolt self locks with finger-tight pressure, manufacturer claims. Molded from corrosion-proof acrylic plastic, bolts remove all metal from the electro-static field.

Hendrix Wire & Cable Corp, 19 Watson St, Boston 18, Mass.



Ignitron Tube

Redesigned ignitron tube for control of frequency-changer resistance welders has 1,200 or 1,500 v maximum anode voltage rating with 1,500 or 1,200 amp maximum anode current. It is called Type WL-5822-A.

Tube features provision for thermostatic control, which when equipped with thermostatic switches, conserves cooling water consumption. It is also said to protect simultaneously the tube and associated equipment from overloads and overheating. The tube has 25-in. over-all length and 4¼-in. diam; weight is 8¼ lb.

Westinghouse Electric Corp, Electronic Tube Div, Box 284, Elmira, N. Y.

Single Phase Motors

Designed for farm applications, two single phase motors feature cast iron construction, rust and corrosion resistance, and moisture-resistant wind-

(*Continued on page* 224)

WHO

BATS HIGHEST IN COVERED CONDUCTOR?

If . . .

YOU CHANGE YOUR ADDRESS

Be sure to notify us so that future copies of ELECTRICAL WORLD will be delivered promptly.

Also make certain you advise your local Postmaster so other important mail doesn't go astray. Both the Post Office and we will thank you for your thoughtfulness.

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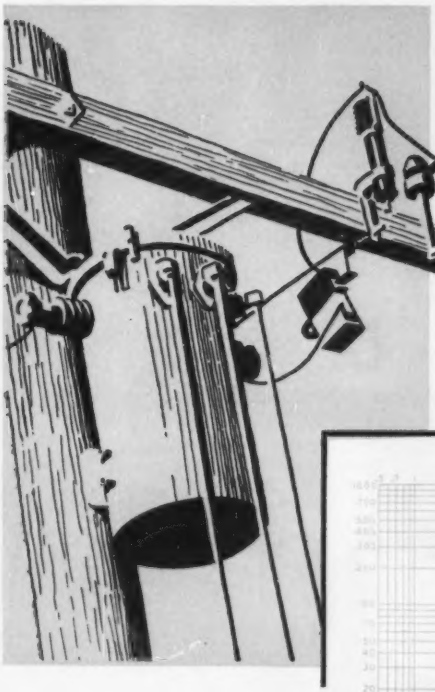


NOW...

full overload capacity transformer protection

without unnecessary outages

NEW CHANCE SloFast Fuse Links follow the Safe Loading Curve

DUAL ELEMENT

SLOW

FAST

The Chance SloFast Fuse Link has two distinct current responsive elements: A slow element, made up primarily of a heater coil and soldered junction with insulated strain pin and ceramic tube; and a fast element constructed like the single element in a conventional fuse link.

This exclusive Chance development gives more accurate, more positive overload capacity protection for distribution transformers than you could ever before obtain.

New Chance SloFast Fuse Links offer 3 advantages over the conventional type: full use of available transformer overload capacity without reducing transformer life . . . virtual elimination of transformer "burn-outs" due to overloads and secondary faults . . . increased continuity of service to your customers.

These fuse links are available in both universal buttonhead and open link styles in a complete range of sizes from 0.2 to 10.4 amps inclusive. All SloFast Fuse Links have ampere ratings identical with the full load ratings of the transformers they are designed to protect. Each fuse link comes in an individual container clearly labeled to show rating. Chance SloFast Fuse Links are sold by leading Electrical Wholesalers everywhere.

Write to A. B. Chance Company, Centralia, Mo., for new bulletin "FUSE LINKS AND HOW TO USE THEM." It contains performance curves and application tables for all distribution voltages.

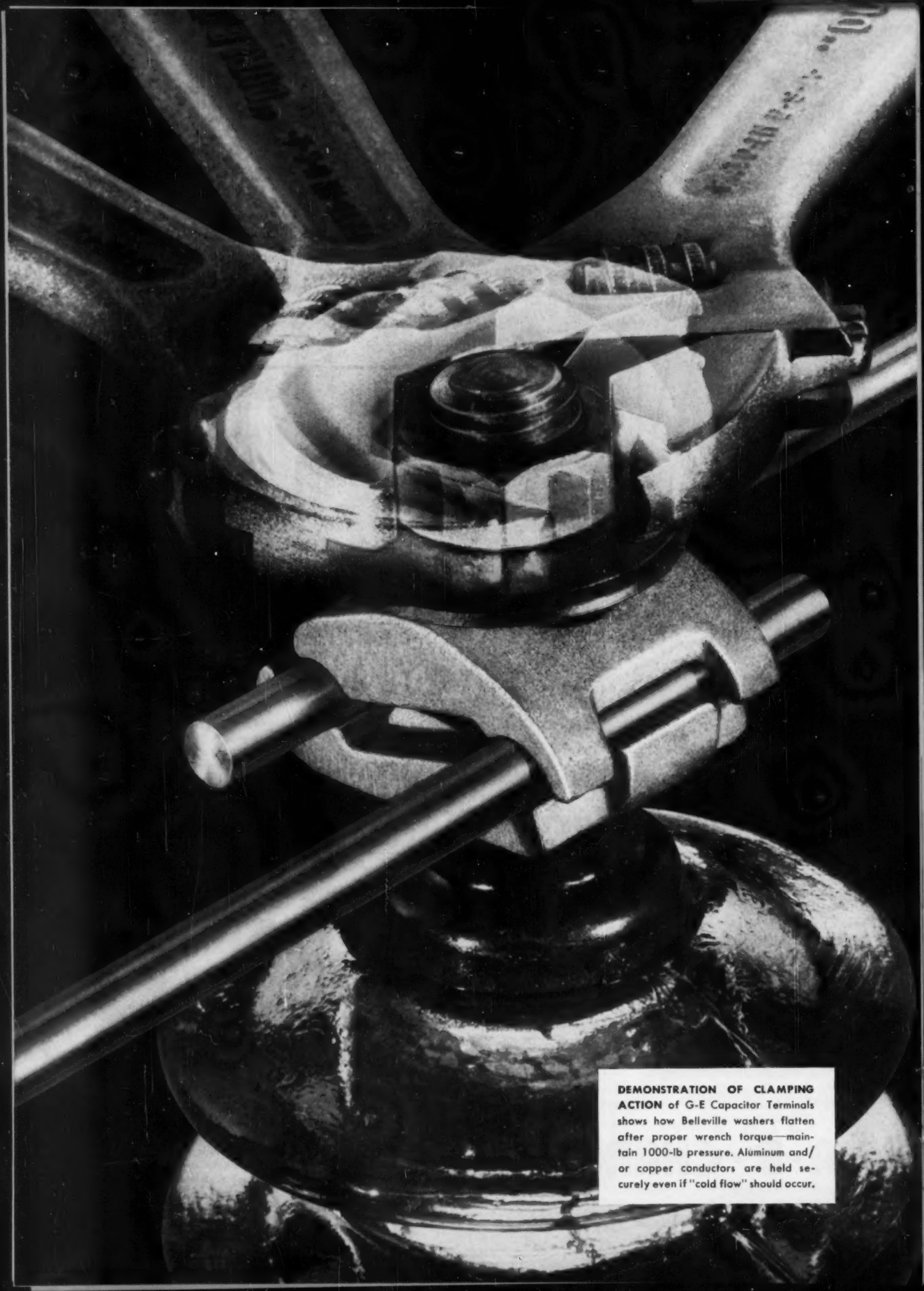
PACKAGED FOR EASY REMOVAL

Linemen can remove links from containers without removing their gloves. A slight, firm twist separates the unit container from the 5-unit container. The end of each unit container is perforated for quick removal of the link.

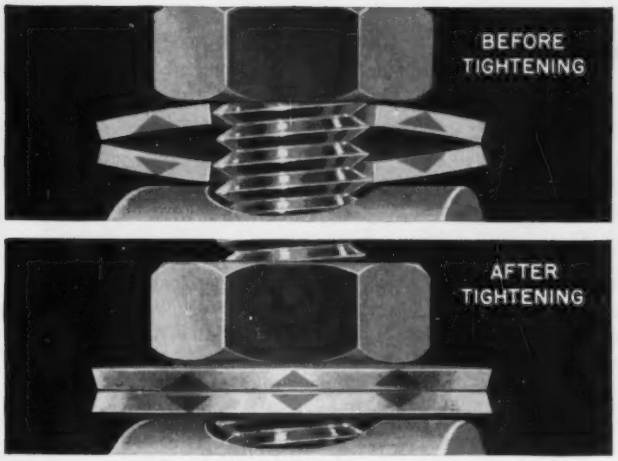
A·B·CHANCE CO.

ASC INDUSTRIES

CF56-20



DEMONSTRATION OF CLAMPING ACTION of G-E Capacitor Terminals shows how Belleville washers flatten after proper wrench torque—maintain 1000-lb pressure. Aluminum and/or copper conductors are held securely even if "cold flow" should occur.



1000-LB SPRING ACTION through compression of Belleville washers. Flattened washers indicate sufficient torque.

STUD STRIPPING ENDED with easy-to-replace nut which strips first if too much torque is applied.

G-E CAPACITOR TERMINALS MAINTAIN LASTING CONTACT

Field-proven assembly compensates for "cold-flow" and eliminates terminal stud stripping

Quick, lasting connections can be made with G.E.'s capacitor terminal assembly. Linemen need only *flatten* the stainless steel Belleville washers with about 2 turns on the nut to securely clamp aluminum or copper conductors. That's because these washers convert 8 ft-lbs of torque to approximately 1000 lbs force on the parallel groove connectors. They also provide a "follow-up" action that compensates for aluminum "cold-flow," thereby maintaining lasting contact pressure.

STRONGEST ASSEMBLY on the market today, the G-E capacitor terminal stud has been subjected to tightening torques of over 70 ft-lbs without damage. If excess torque is applied, the threads on the nut, which has been designed as the weakest member of the assembly, will strip before those on the stud.

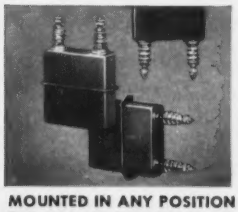
WIDE RANGE OF CONDUCTORS (AL/CU) from No. 2 to No. 9 AWG (stranded) or No. 10 AWG (solid), can be securely clamped with G.E.'s parallel groove connector. A conductor can be easily inserted without threading or removing any hardware.

ENGINEERED EXTRAS such as this new terminal combine to make General Electric capacitors the most practical . . . and economical unit for you. For complete information about them, contact your G-E Apparatus Sales Representative or write for bulletin GEA-6260, General Electric Company, Schenectady 5, New York. 441-28

Progress Is Our Most Important Product

GENERAL ELECTRIC

ONLY G-E CAPACITORS HAVE ALL THESE Engineered Extras AT NO EXTRA COST

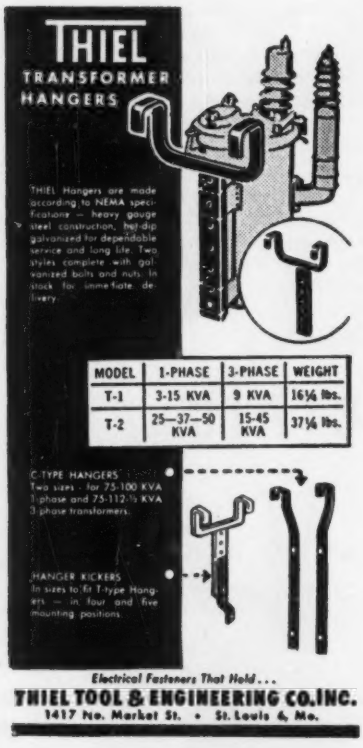


MOUNTED IN ANY POSITION G-E capacitors maintain uniformly high efficiency.

CORROSION-RESISTANT CASE, tin plated inside and outside, prolongs capacitor life.

SMALLER AND LIGHTER, than any other make, for easiest handling and installation.

EXTRA-STRENGTH BUSHINGS, welded then soldered to case, maintain hermetic seal.


THIEL
TRANSFORMER
HANGERS
THIEL Hangers are made according to NEMA specifications — heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts. In stock for immediate delivery.
MODEL | 1-PHASE | 3-PHASE | WEIGHT
T-1 | 3-15 KVA | 9 KVA | 16⅛ lbs.
T-2 | 25—37—50 KVA | 15-45 KVA | 37⅛ lbs.
C-TYPE HANGERS
Two sizes - for 75-100 KVA 1 phase and 75-112½ KVA 3 phase transformers.
HANGER KICKERS
In sizes to fit T-type Hangers — in four and five mounting positions.
Electrical Fasteners That Hold...
THIEL TOOL & ENGINEERING CO. INC.
1417 No. Market St. • St. Louis 6, Mo.

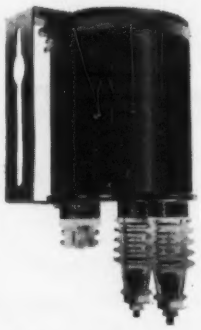
Single Phase Motors

(*Continued from page* 220)

ings. Repulsion-induction motor, 1 to 7½ hp, is reportedly not affected by extremely low voltages. Recommended usage is on silo unloaders, barn cleaners, milking machines and other farm applications.

Capacitor motor is suited for 24 hr/day operation on ventilating fans, driers, grain and hay blowers, irrigation pumps and other equipment. Sizes are from 1 hp to 15 hp.

Peerless Electric Co, Warren, Ohio.



Customized Transformers

Features of a line of customized small transformers include universal-type mounting, low cost terminal construction, aluminum casing and rubber-covered leads. Also featured is multi-range regulator design ballast with primary voltages from 100 to 520 v.

The single unit serves 115-230-v lines and second unit is available for 460-480-v distribution. In addition to single unit, a twin adaptor is available for twin-light installations.

General Electric Co, Schenectady 5, N. Y.

Water Fire Extinguisher

A stored-pressure water fire extinguisher features shut-off control, a start-to-finish range of 35 to 40 ft, and is operable down to −40 F, according to manufacturer. Water stream is released by the squeeze grip carrying handle.

Extinguisher has 2½-gal capacity. After use it is recharged by replacing water and pressurizing the unit to 100 psi. A tricolor pressure gauge is mounted on top. The unit is available in steel, brass and chrome-plated brass.

Ansul Chemical Co, Marinette, Wis.

Germanium Rectifier

Incorporating automatic voltage stabilization and remote stepless reactor control, a germanium plating rectifier is said to provide savings because of a unified design. Available in ratings from 6 to 24 v and up to 4,000 amp, units reportedly occupy less than 9 sq ft of floor space.

Output voltage is controlled by a reactor, eliminating moving parts, and reducing maintenance cost and down time.

Voltage is maintained automatically, regardless of tank load changes or ac line voltage variations. Control system has a magnetic amplifier that signals reactor for adjustments when actual voltage differs from desired voltage.

General Electric Co, Schenectady 5, N. Y.

'Ultrasonic' Cleaner

Designed for bench-top operation, an "ultrasonic" cleaning apparatus features quick, all-surface cleaning action. It is designated Model AP-10-B. Instrument comprises a 36-40 kc power generator, and a cylindrical tank, with transducers hermetically sealed into base. RF generator output is 50 w average, 200 w peak on pulses. Tanks have 1-pt, 1-qt or ½-gal capacity, manufacturer reports.

Two of smaller tanks may be operated simultaneously, and two of larger ones alternately, depending on tank size specified.

Branson Ultrasonic Corp, 37 Brown House Road, Stamford, Conn.

(*More New Equipment on page* 229)

Need specialized help in any of these directions?

The modern approach to solving special operating problems is to call in specialized help. That way you don't divert your own key personnel from regular duties. You don't overburden your regular staff. And you save a maximum of payroll dollars. Backed by long experience in solving similar problems for utility companies throughout the United States and abroad, Ebasco gets to work promptly, gets the job done right and economically while your normal flow of routine operations continues.

Ebasco technicians are at your call anywhere and anytime you need them, for assignments large or small in any phase of utility operation.

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COMPLETE ENGINEERING AND CONSTRUCTION SERVICES

In addition to assisting with operating problems, Ebasco offers a complete engineering and construction service for building new facilities or additions to present installations—from initial planning to actual operation of the plant. A half century of experience in the electric power industry stands behind this service.

For a complete outline of the services Ebasco offers to the public utility industry, write for our booklet, "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. M, Two Rector St., New York 6, N. Y.

To meet local peak

Electro-Mobile Power, such as this Commonwealth Edison unit, puts a fully automatic source of added capacity into regular peak-skimming service, and is constantly ready with substantial stand-by power for emergencies.

demands at low cost

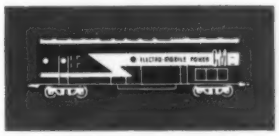
Strengthening service to growing communities . . . . supplying seasonal load demands, or wherever line extensions would be a costly alternative . . . . these too, are jobs for Electro-Mobile Power.

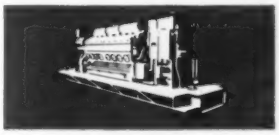
For full details, write to:

Rail car, truck trailer and portable units— 350 to 1,000 kw.

ELECTRO-MOTIVE DIVISION

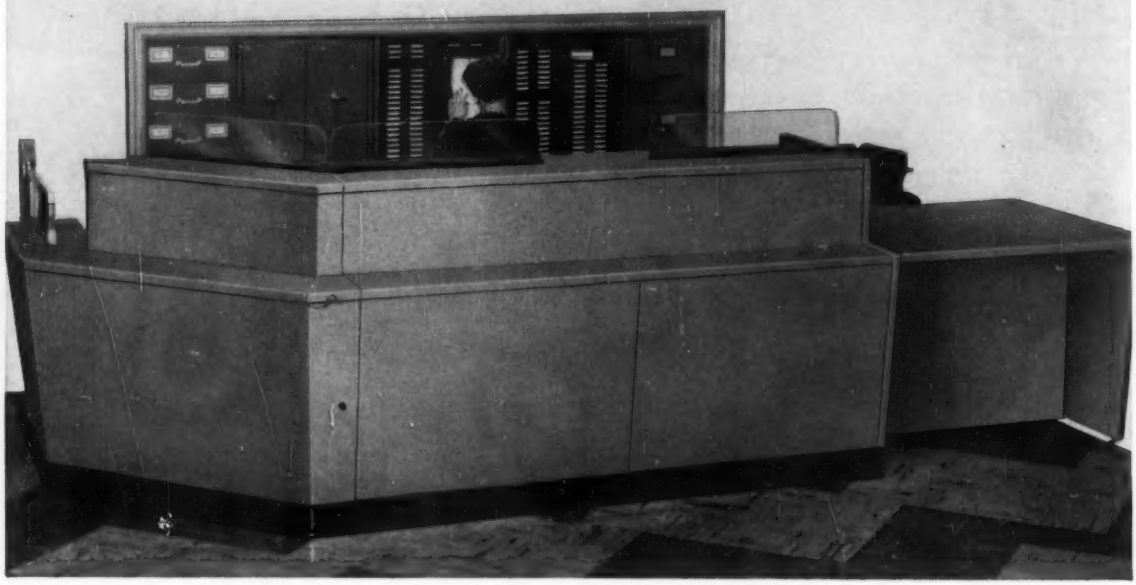
GENERAL MOTORS LA GRANGE, ILLINOIS





Sold and serviced directly through Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco. In Canada: General Motors Diesel Limited, London, Ontario

cordial customer convenience



The new REMINGTON RAND Sectional Customer Service Counter is designed for combination of cashiering and bookkeeping. It offers custom made beauty and efficiency without custom-made limitations—at a mass-production price.

Rapid face-to-face service to customers is provided. The counter is ideal height, and there is a continuous parcel shelf for resting packages or bundles. The working area side is compact without being crowded. Customer service and history records are within arm's reach in the SAFE-KARDEX cabinets in the rear.

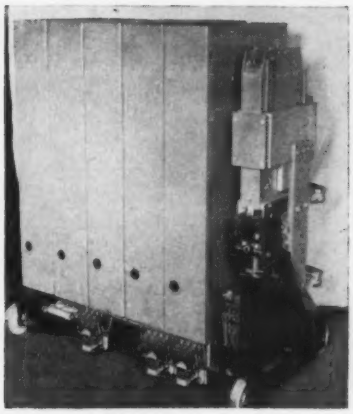
With complete facilities within arm's reach, the clerk works comfortably seated, ending the usual "standing" counter cashiering —the fatigue and errors which result.

Certified, insulated pedestal units provide 24-hour, point-of-use protection against fire for vital records. Uninsulated pedestal units are available for records which can readily be duplicated. In larger offices, two or more units may be joined, providing any desired number of work stations.

See for yourself the many advantages of the Sectional Customer Service Counter. Send for our free booklet on the subject, SC764. You'll find it interesting and informative. Just write Room 1959, 315 Fourth Avenue, New York 10.

Remington Rand

DIVISION OF SPERRY RAND CORPORATION



Anode Circuit Breaker

Designed for application with mercury arc rectifiers, an anode circuit breaker is rated either 750 or 1,000 v dc output, 2,500 amp rms continuous, and has 75,000-amp interrupting capacity on first loop of arc-back current, according to manufacturer.

Breaker trips only on high reverse current and recloses automatically after 15-sec delay, manufacturer reports. Reclosing time can be shortened to as little as one second.

Normally used in six-phase arrangement, each pole has its own magnetic solenoid closing mechanism. Simple construction, few parts, ease of adjustment, reduced maintenance and flexibility of arrangement are features claimed through absence of mechanical connection between poles.

Individual pole units are pedestal mounted and are available as metal-closed draw-out unit or as stationary frame unit.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Watthour Meter Tester

Main feature of watthour meter-testing equipment is a heavy duty lever switch said to speed and simplify equipment operation. The single-switching reportedly simplifies the multicircuit switching methods used in current and potential circuits and minimizes test errors.

The switch features rigidly braced nickel plated brass frame and positive, adjustable locking mechanism. Contact assemblies are actuated by phenolic rollers mounted on side of cam to provide smooth operation, according to manufacturer.

Knopp, Inc, Oakland, Calif.

AC Capacitors

Redesigned capacitors in smaller, rectangular cases are available at 236, 330, 440 and 660 v ac, 60 cycles, in capacitance ranges from 1.0 to 60.0 mfd, depending on voltage. Designated Type KGN, the series features Dykanol impregnants (Dykanol J available to —40 C), low power factor, high insulation resistance and high voltage breakdown. Units have multi-layer capacitor windings, extended-cycle impregnation, and compression-sealed terminal bushings, manufacturer reports. Bulletin 179 is available.

Cornell-Dubilier Electric Corp, South Plainfield, N. J.

Adjustable-Speed Drive

Expanded line of adjustable speed drives are available in ¼ and ½-hp models with either geared or ungeared motors. Motor armatures reportedly deliver constant torque at speed adjustable from near zero to 2,400 rpm. Control head utilizes low voltage circuits which may be installed from remote points. Reversing control and dynamic breaking models with low voltage relays are said to be adaptable for automatic control applications.

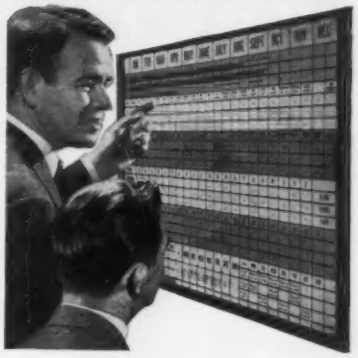
Servo-Tek Products Co, Inc, 1086 Goffle Road, Hawthorne, N. Y.

Floodlight

A general purpose, 17-lb aluminum floodlight is said to be suitable for sports and recreation, commercial, railroad and transportation and industrial applications. Designated L-69A, the unit features a faceted rear reflector which reportedly helps provide high average maximum beam

(*Continued on page* 232)

You Get Things Done With Boardmaster Visual Control



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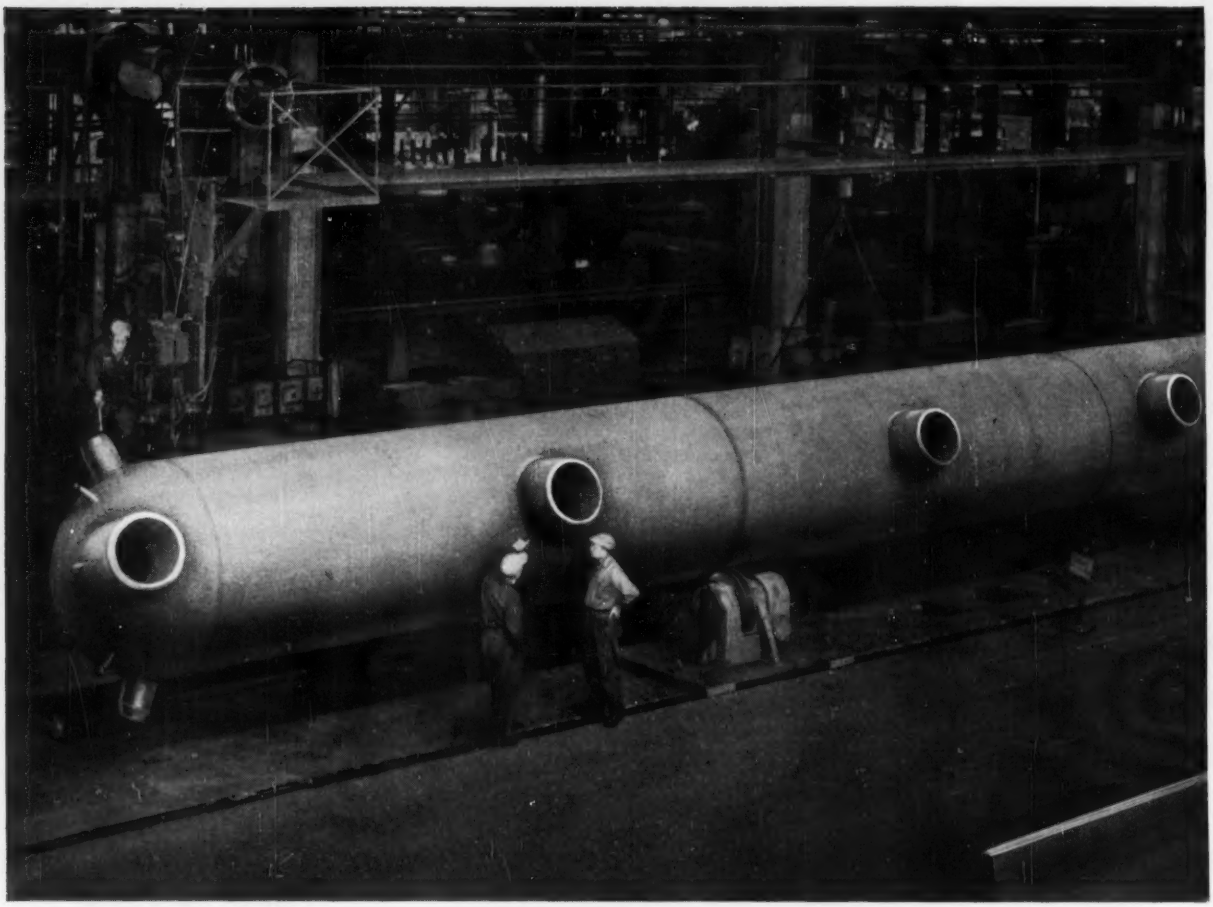
CALLS THE PLAY IN COVERED CONDUCTOR?



CONSTRUCTION IN HIGH

Two of the world's largest boilers for

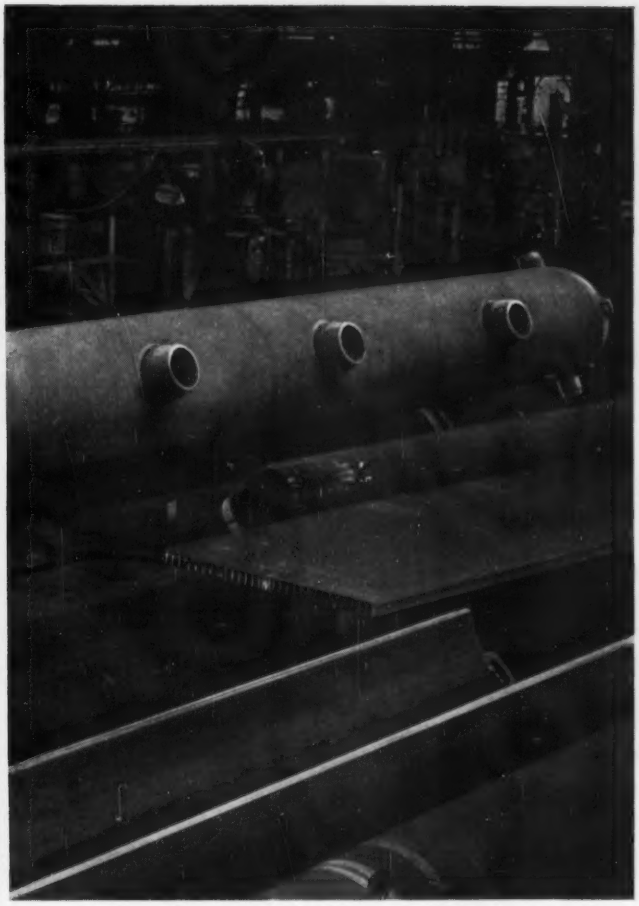
Keeping ahead of the world's greatest city is no easy task—but for many years "largests" and "firsts" have had to be the rule with New York's source of light and energy.

B&W furnished the first million pound per hour boiler for Con Edison's Hell Gate Station back in 1930. Many other engineering advances later accepted as standard in the industry have been pioneered on this system. For example, B&W furnished —for Con Edison's Astoria Station—the first pulverized-coal-fired pressurized boilers operating without induced draft fans.

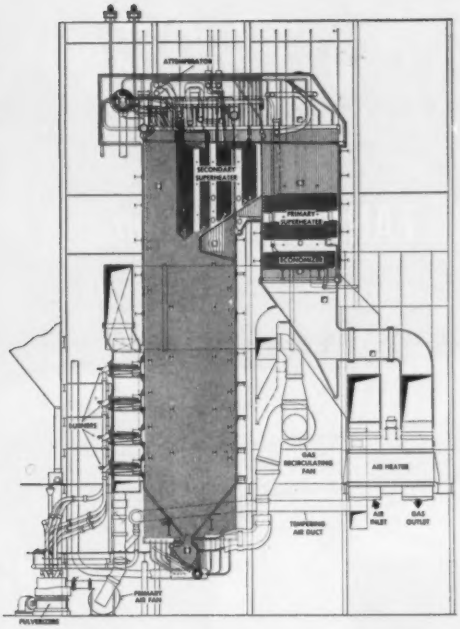
And now, this latest step: two huge B&W Radiant Boilers being built for Con Edison . . . right in line with Con Edison's long-standing policy of progressive engineering.

Each B&W Radiant Boiler has a capacity of 2,400,000 lb of steam per hr and features pressure-firing, natural circulation, and separate furnaces with a single steam drum. The unit for Astoria is the third pressure-fired B&W Boiler to be designed for this new modern station of the Con Edison System.

In all but size and design details, Con Edison's new boilers are typical of many other B&W units now providing dependable, efficient steam generation in central station and industrial plant service.



The world's largest boiler drum . . . over 100 feet long, 66 inches inside diameter . . . is shown in a finishing bay at the B&W Barberton Plant awaiting shipment to Con Edison. It weighs over 200 tons.



One of the two identical B&W units for Con Edison's Astoria and Arthur Kill Stations. It is a horizontally pressure-fired, coal-burning Radiant Boiler designed for dry ash removal. Type EL Pulverizers are used to permit reliable, efficient, direct-firing of pulverized coal. The unit has a design pressure of 2500 psi, steam temperature of 1050 F and reheat to 1000 F. The secondary superheater is located at the exit of one furnace, and the reheater at the exit of the other furnace. The primary superheater is back of both the secondary superheater and the reheater. The giant drum, with Cyclone Steam Separators for natural circulation, provides nearly 100% separation of steam from water.

GEAR AT CON EDISON

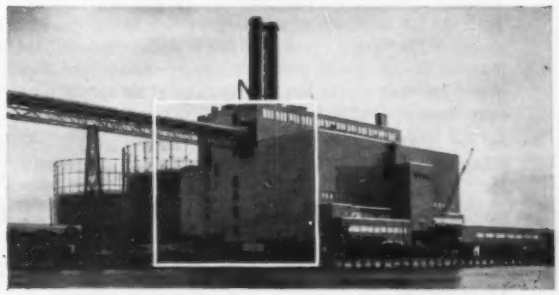
Astoria and Arthur Kill Stations

B&W engineering advances in terms of improved steam generation efficiency—under your fuel and operation conditions... are available to you. Write, The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N. Y.

G-813-CS

BABCOCK & WILCOX

BOILER DIVISION

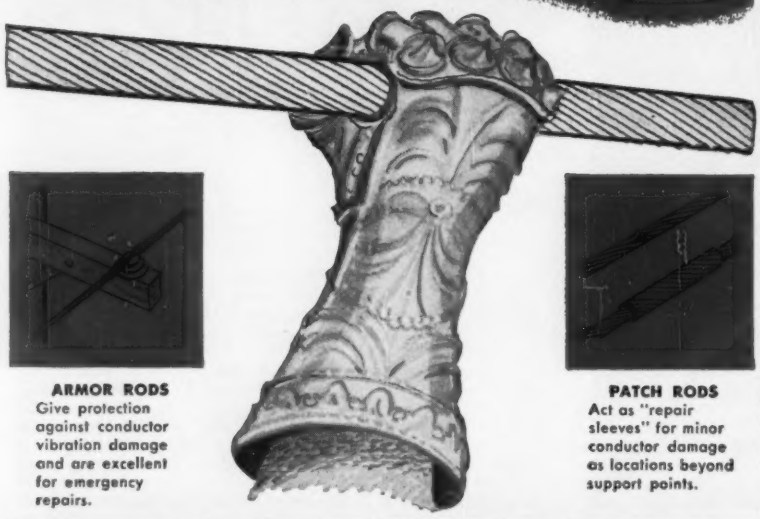


Area outlined in white shows construction area on third unit for Con Edison's Astoria Station.

WHEREVER Protection IS NEEDED ON OVERHEAD CONDUCTOR LINES

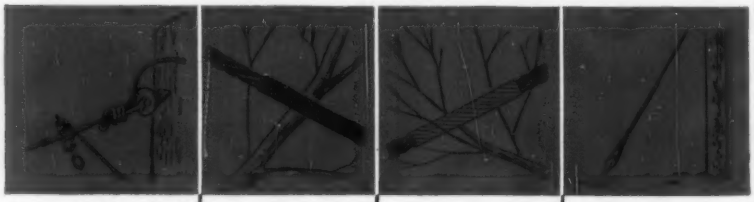
fine FANNER Superformed PRODUCTS

provide it better... easier... at substantial savings



ARMOR RODS
Give protection against conductor vibration damage and are excellent for emergency repairs.

PATCH RODS
Act as "repair sleeves" for minor conductor damage as locations beyond support points.



TAP ARMOR
Protective layer of shortened rods facilitate making taps without risking conductor damage.

PLASTIC FANNGUARDS
Tough, durable plastic sleeves used on covered wires for protection against tree abrasion.

ALUMINUM LINEGUARDS
Made to protect triplex cable or bare conductors against abrasion electrical damage.

FANNGRIPS
For a permanently positive grip on guy strand with maximum economy in material and labor.

Whenever you need accessory items for overhead distribution and transmission lines, you'll do far better by standardizing on Fine FANNER Superformed PRODUCTS. Each product in the FANNER Superformed line is precision manufactured to install easier and faster on the job. Careful packing insures safe delivery and simplified storage. Highest quality materials provide long life regardless of the type of installation. With all their extra features, FANNER Superformed PRODUCTS cost no more than ordinary products.

For full information on the Fine FANNER Superformed Line, write for literature and prices today!

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THE FANNER MANUFACTURING CO.

Electrical Products Division

Brookside Park Established 1894 Cleveland 9, Ohio

AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

Floodlight

(*Continued from page* 229)

candlepower and good candlepower distribution. It is available in wide, medium and narrow widths. Bulletin GEA-6435 is available.

General Electric Co, Schenectady 5, N. Y.

Compression Connector

Featuring an octagon shape, non-tension compression connector reportedly gives tight connection with less effort. As pressure is applied, high points compress first and fill conductor interstices with metal.

The grease-filled connector also features a center dividing wall which forces grease back through lay of conductor during insertion. This is said to seal out corrosive media. The wall reduces bi-metallism and controls length of conductor inserted so each side has identical holding power, the maker claims. The oxide preventative grease is retained in color-coded plastic caps.

A "one-handed" tool is available for use with octagonal connector but other tools may be used.

Fargo Mfg Co, Poughkeepsie, N. Y.

Motors

Line of integral horsepower induction motors in NEMA frames (up to 30 hp) has been redesigned. Motors are reportedly smaller, lighter, better enclosed and more compact.

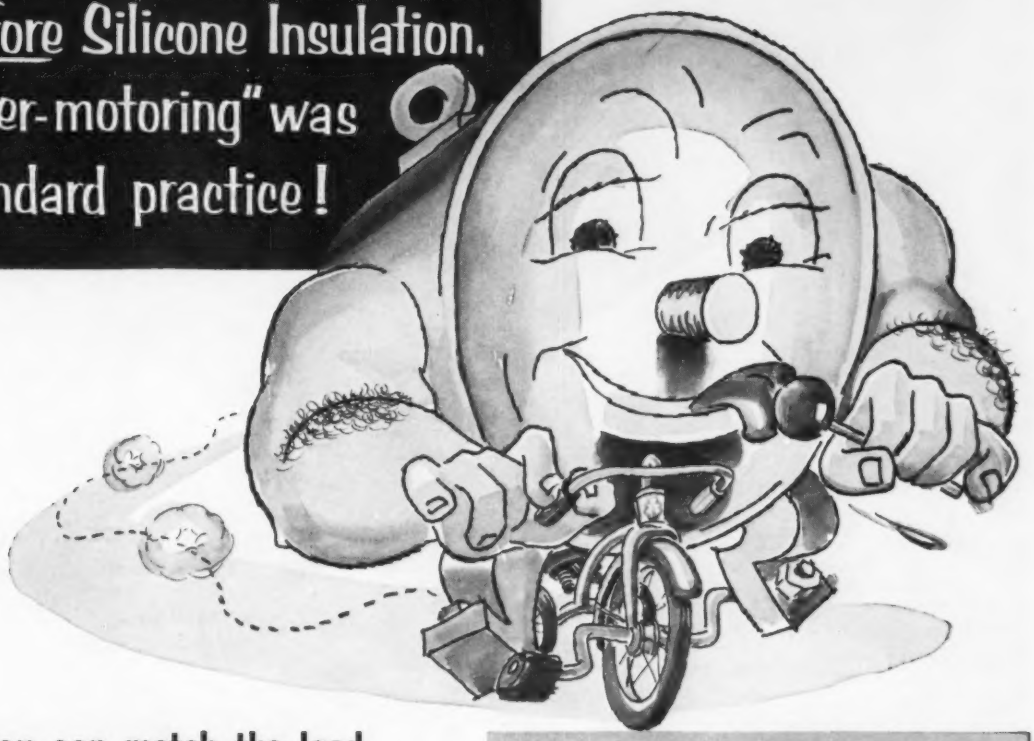
Conventional "open" motor is superseded by dripproof-protected design, which is said to be essentially splashproof. Totally enclosed fan-cooled design is refinement of ribbed frame motor.

Insulation of this Type N line is said to take advantage of controlled synthetics, providing high dielectric strength and resistance from moisture, heat, abrasion and corrosion. Standard bearing is open greaseable design. Bulletin PB 6000-6 is available.

Elliott Co, Jeannette, Pa.

(*More New Products on page* 236)

Before Silicone Insulation, "over-motoring" was standard practice!



Now you can match the load . . . let silicones carry the overloads

Lazy motors cost money! Why continue to pay a fat premium for motors that make kid's play of their average work load? Today, you can save money by using *silicone insulated* motors rated to *match your average load*. Their built-in service factor of 25 to 50% will handle most intermittent overloads or loads that can't be matched in standard frame sizes.

Cut your capital investment and installation costs! Think of it—for every dollar dumped into *unused* motor capacity, you spend an extra $3 for starters, cable, transformer capacity and installation costs.

Enjoy more continuous production! You can depend on motors insulated with Dow Corning silicones to have maximum resistance to such motor killers as heat, moisture and corrosive atmospheres.

Remember, over-motoring is outmoded

Get sources for silicone insulated equipment—mail coupon today

Dow Corning Corporation, Dept. 4409a, Midland, Mich.

Please send me sources of supply for new Silicone (Class H) ☐ Motors ☐ Transformers

NAME _____ TITLE _____

COMPANY _____

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Rolling up more evidence...

R. G. LeTourneau, Inc. of Longview, Texas, installs a silicone insulated d-c motor in each of the 24 electric wheels of the giant "Sno-Freighter." Silicone insulation is used to give maximum power per pound under tough operating conditions. The silicone insulated motors, located in tubular axles and connected through a gear train in the wheel hubs, demonstrate the advantages of placing the power unit close to the work . . . a basic principle made practical by the heat stability of Dow Corning silicone dielectrics.

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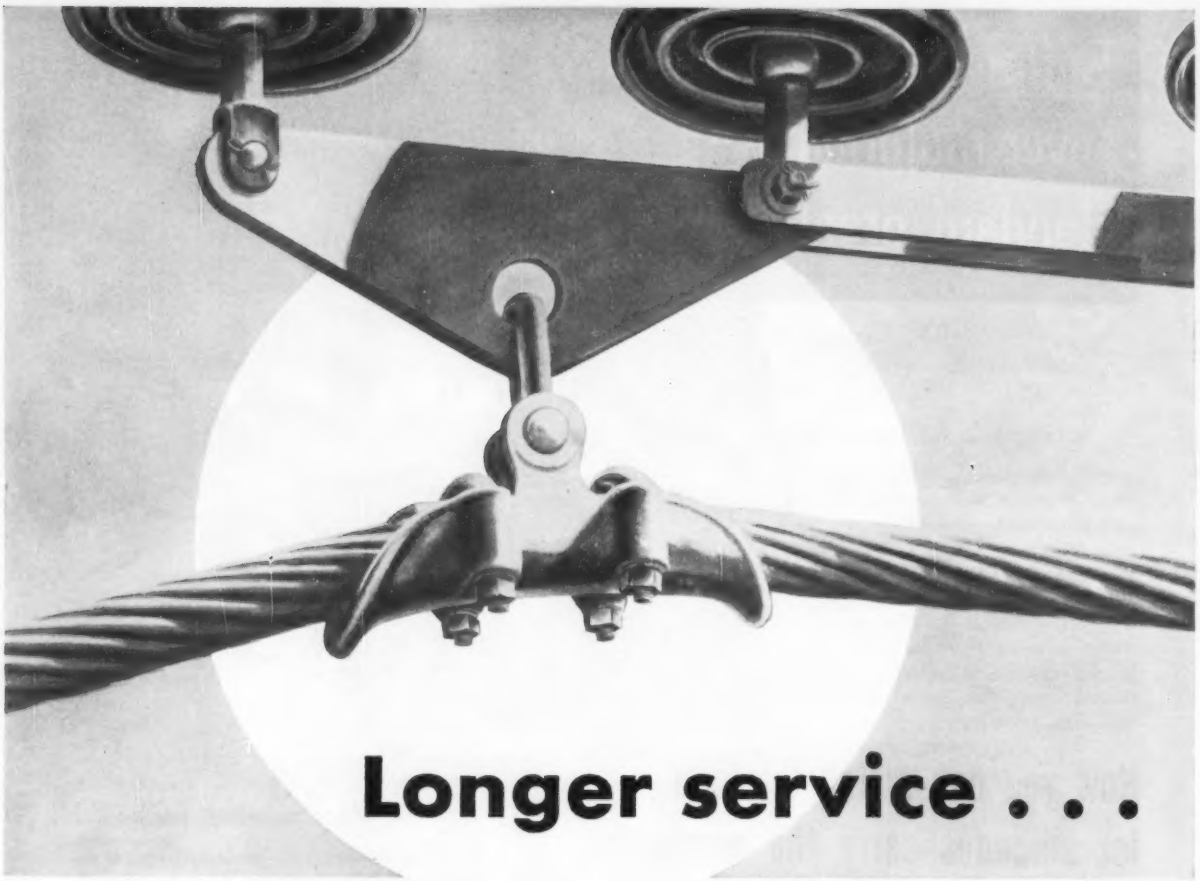


Longer service . . .

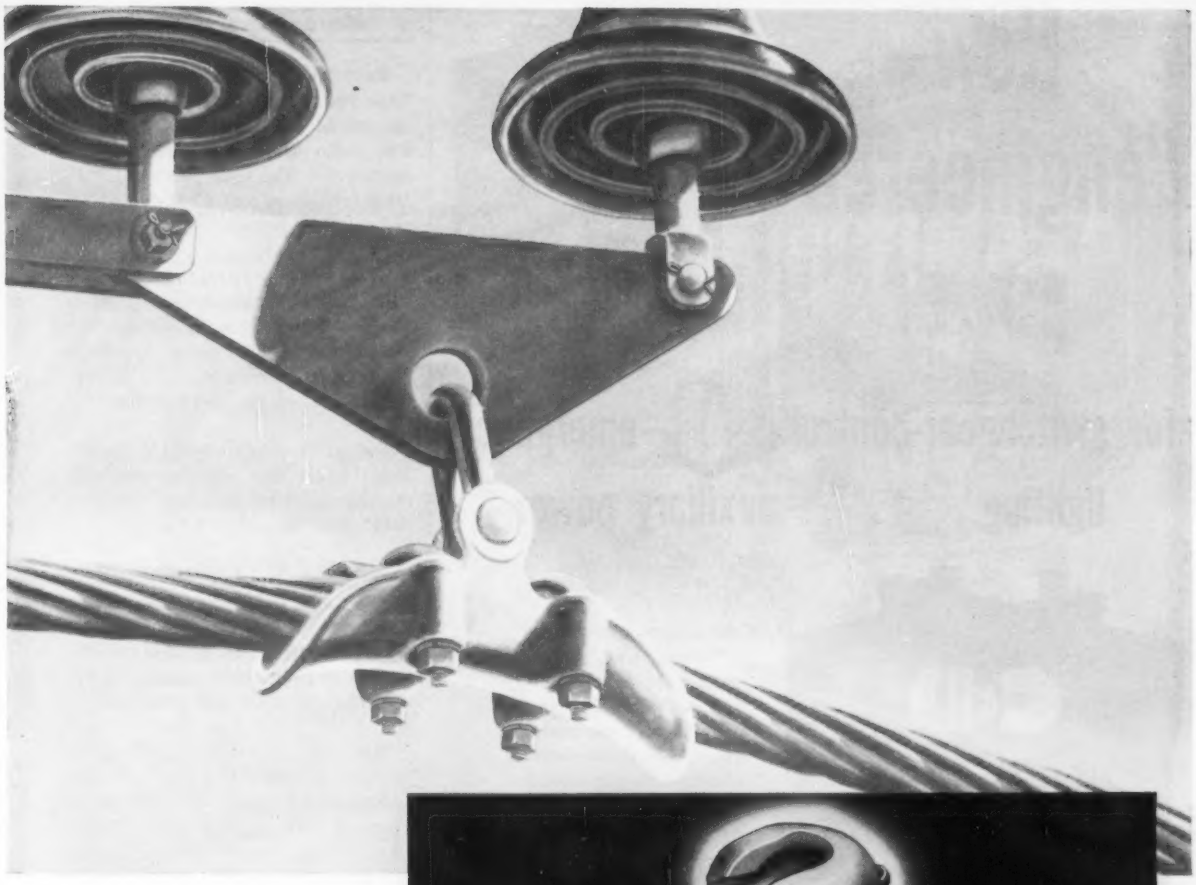
One of the basic advantages you get with

BTC MPL Aluminum Suspension Clamps

BTC SUSPENSION CLAMPS possess exceptional strength due to their forged aluminum alloy construction. This greater strength insures against failure under severe loading and results in long, trouble-free operation. The clamp's greater hardness prevents excessive wear at points in contact with supporting pin.

THE CLOSE-GRAIN non-porous structure of the BTC forged clamp body also effectively prevents destructive internal seepage of corrosive elements . . . a cause of failure in some transmission line fittings produced by other processes.

INSIST ON BTC Drop-Forged Aluminum Suspension Clamps the next time you order from your insulator manufacturer. Their longer service life is only one of many advantages you get with these superior clamps.



TWELVE CLAMP SIZES are offered . . each obtainable with socket, clevis eye or without adapter for use with U-Bolts or J-Bolts. A total of 72 variations are available.

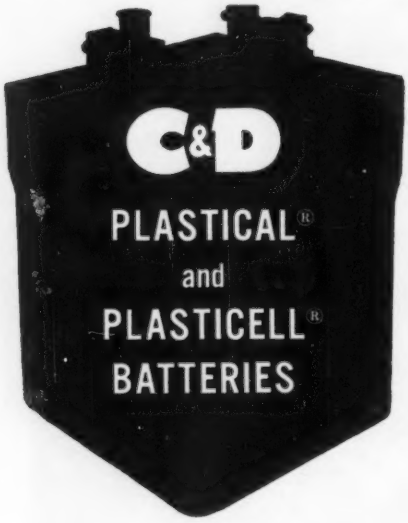
Specify BTC **DROP-FORGED Hi-Line Hardware**

. . . From Your Insulator Manufacturer

The BREWER-TITCHENER CORPORATION, Cortland, New York

Now— "engineered" power

for switchgear-control —emergency lighting —auxiliary power



Compact, modern-design "power plants" engineered for specific applications! C & D PlastiCals and PlastiCells give you completely dependable power— *where power must not fail!*

PlastiCal—with lead-calcium grids for maximum life— is conservatively engineered for at least 25 years in full-float service. PlastiCell—with high-tensile alloy grids— has a projected life of 14 years in float service.

WITH BOTH PLASTICAL AND PLASTICELL YOU GET SUCH ADVANCED C & D DESIGN EXTRAS AS:

1. Extra-long life—exclusive design combines advantages of both suspended and supported plate construction.
2. Triple insulation—thick Fiberglas mat, microporous separators, and perforated Koroseal retainer.
3. Saftee-Vent—outstanding C & D development that prevents accidental battery explosions.
4. Crystal-clear plastic jars—heat-resistant and hermetically sealed.
5. Plastite Post Seals—for easier maintenance, and at the lowest lifetime cost.

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CP-536 Rev. 1 on PlastiCal Batteries
CP-537 Rev. 1 on PlastiCell Batteries

C&D BATTERIES, INC.
of Conshohocken, Pa.
Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

More New Products

Radio Corp of America, 30 Rockefeller Plaza, New York 20, N. Y., has introduced three high-power, mobile **FM radio systems** from 25 to 54 megacycles. The series includes CMF-100B (100-w output), CMF-55 (55-w), and CMF-40 (40-w).

Toledo Pipe Threading Machine Co, Toledo, Ohio, offers portable **power drive** No. 68 for pulling, lifting, threading and turning. Weight is 33 lb. It is powered by 115-v reversible ac or dc or 90 psi air motor.

Hobart Bros Co, Hobart Square, Troy, Ohio, has 300 and 400-amp **rectifier welders** featuring "diverter path" control.

Alpha Metals, Inc, 56 Water St, Jersey City, N. J. offers general purpose kit with 16 advanced **fluxes** for electronic assemblies, printed circuits, tinning and hot solder dipping, stainless steel and aluminum soldering.

Keystone Mfg Co, Center Line, Mich., has line of 3¼-in. octagon **outlet boxes and box-bar combinations.** They are said to save time and labor.

Talbert Trailers, Inc, 7950 W. 47th St, Lyons, Ill., offers 90-ton capacity Model TDW-90-RG **low-bed trailer.** It provides over-front or over-back end loading. Length is 45¾ ft, width, 10¼ ft, and rated capacity, 90,000 lb.

Versabar Corp, 521 Communipaw Ave, Jersey City, N. J., offers Speedwall, a metal framing **partitioning** system for attachment of electrical conduit, switch gear, piping and shelving, panels and brackets.

General Electric Co, Schenectady 5, N. Y., has six kits for on-the-spot modification of its **magnetic starter.** Changes can include installing push button or selector switch in starter cover, changing fuse clips on disconnect switch, changing coil, adding third over-load relay, or adding auxiliary interlock kit.

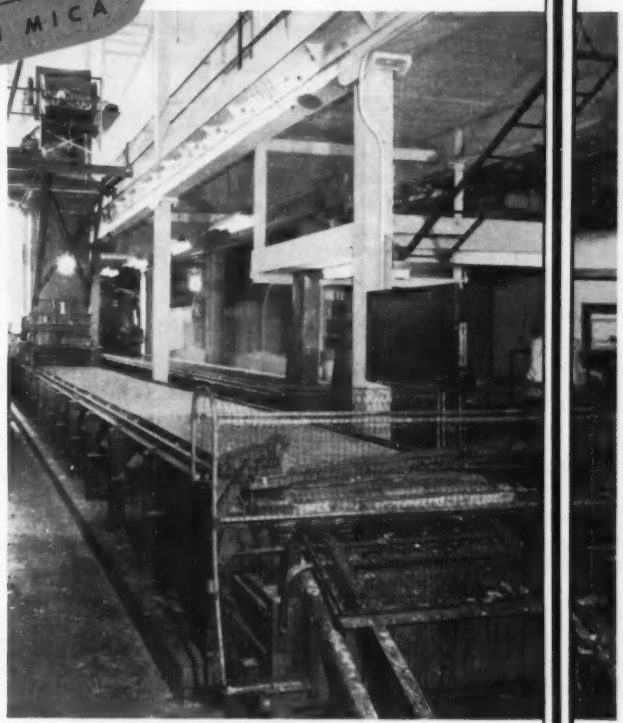
Anchor Metal Co, 244 Boerum St, Brooklyn 6, N. Y., offers **solder Microforms** in amounts and shapes designed for efficient joining operations.

(*More New Products on page* 238)

THE ULTIMATE IN MICA

Because Mica is Mica—
because under certain conditions
it admits no substitute—
because Natural Mica must be
processed to use—
because Macallen has been processing
Mica for 60 years—
When Mica is specified - go all the way
and specify

MACALLEN MICA
THE ULTIMATE IN MICA



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A MUST for Electrical Engineers!

The Art and Science of PROTECTIVE RELAYING

By
C. RUSSELL MASON,
Application Engineer,
General Electric Co.

For the novice—a basic introduction to the essential principles of relay design and application, and a valuable source of clear, up-to-date information. For the practicing engineer—a full and dependable reference with a new and different approach and plenty of source material.

The extensive coverage includes:

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- **How to design relay systems and to apply relays to get the optimum results.**
- **Complete references to basic source material.**

It offers only essential information that has practical utility. The basic training provided in this book will prove useful to the application of protective relaying equipment of any manufacturer. One of a series written by General Electric authors for the advancement of engineering practice.

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More New Products

(*Continued from page* 236)

Parr Paint & Color Co, 18312 Syracuse Ave, Cleveland 10, Ohio, says its **spot weld elastic sealer compound** eliminates copper oxide electrode failures.

Olin Mathieson Chemical Corp's Electrical Div, 460 Park Ave, New York 22, N. Y., has an emergency **safety signal kit** for autos.

Miller Eqpt Co, Inc, Franklin, Pa., offers vinyl-coated nylon **glove bag** which protects against water, mildew.

Zaco Laboratories of Zip Abrasive Co, 1360 W. 9th St, Cleveland 13, Ohio, has **Dyeline spray** that detects surface flaws of non-porous materials.

Charles Machine Works, Perry, Okla., offers 150-lb **trenching machine** for narrow lighting circuit jobs of 2 in. widths and 2 to 18 in. depths.

Tapecoat Co, 1523 Lyons St, Evanston, Ill., announces Tapecoat, a **protective coating** with film-type, self-disposing liner.

Damol Corp, 541 Land Title Bldg, Phila. 10, Pa., offers **safety shutoff and alarm** for automatically controlled heating processes. It requires no sensing elements or electronic circuitry.

National Cylinder Gas Co, 840 N. Michigan Ave, Chicago 11, Ill., has **portable resuscitator** with a mask usable up to 200 ft from supply.

Minneapolis-Honeywell Regulator Co,'s Micro Switch Div, Freeport, Ill., offers pre-assembled **pushbutton switch** for computer, appliance and industrial machinery applications. Rating is 15 amp, 125 or 250 v ac; 1 hp, 250 v ac; ½ hp, 125 v ac.

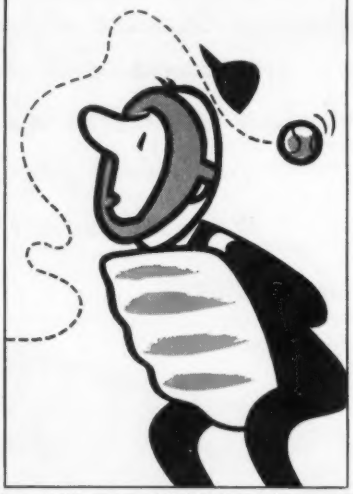
Instrof Div of T. J. Cope, Inc, Collegeville, Pa., has standardized system of continuous **support for instrument tubing** which aids on-the-site assembly.

Holub Industries, Inc, Sycamore, Ill., has **fish tape winder** that fits 12-in. reels with ⅛-in flat fish tape.

J. H. Holan Corp, 4100 W. 150th St, Cleveland, Ohio, has made curved corner and second front windows optional on all **crew compartments.**

WHO

PITCHES WINNERS IN COVERED CONDUCTOR?



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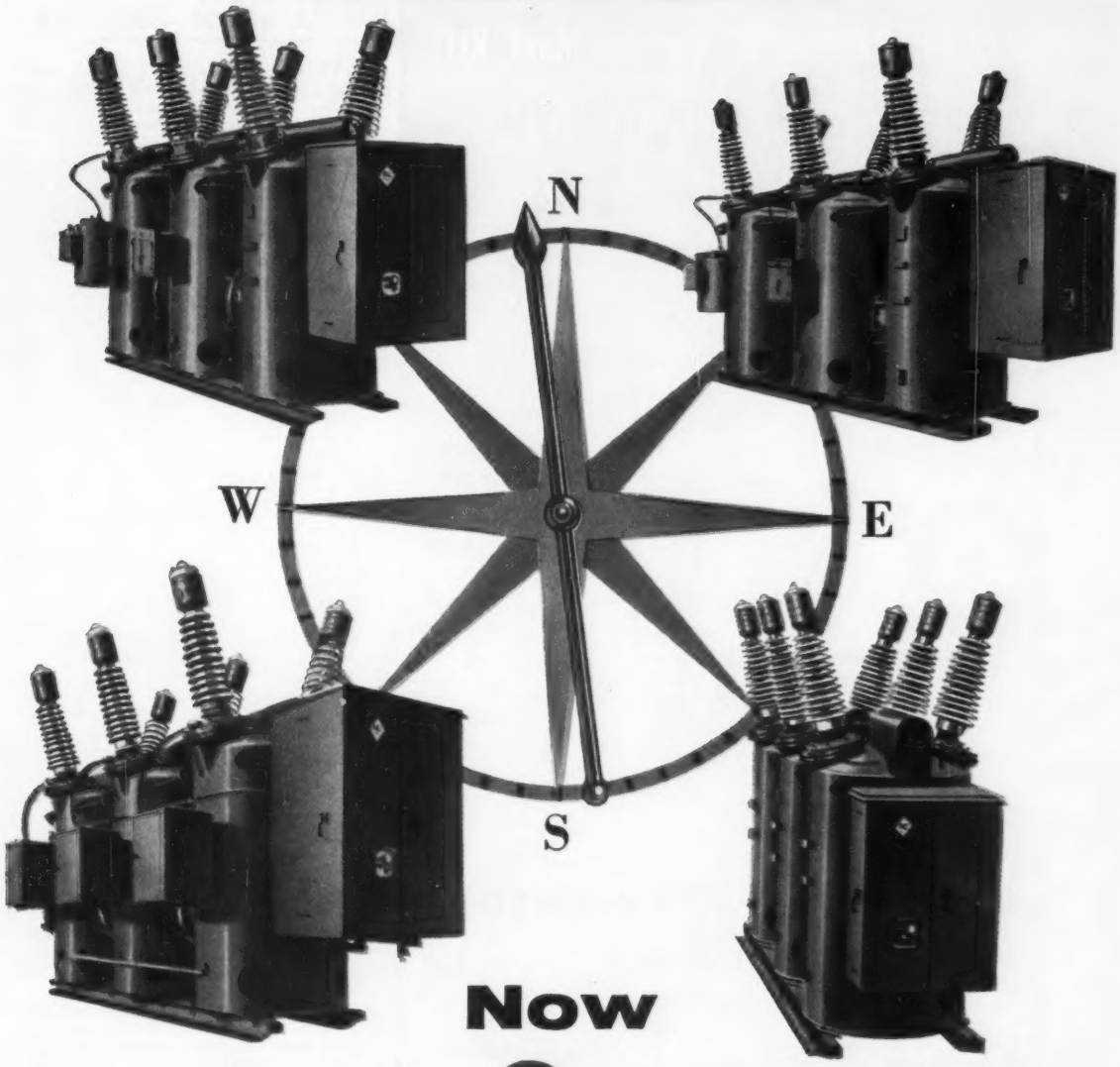

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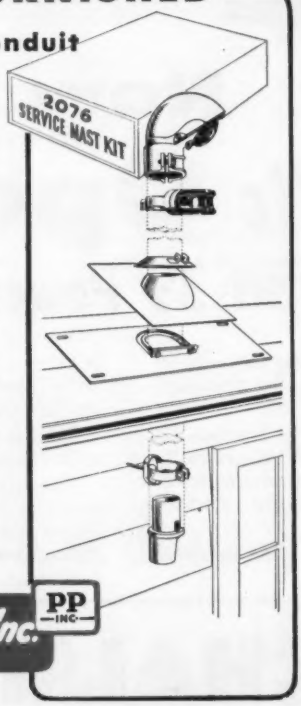

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CATALOGS—BULLETINS

● **INSULATION:** Use of Irrathene irradiated polyethylene tape as insulation by motor repair shops is described in Brochure CCD-1. General Electric Co, Chemical Development Dept, 1 Plastics Ave., Pittsfield, Mass.

● **VIBRATION:** Bulletin 901, 4 pages, contains vibration isolation efficiency curve and data on vibration and noise control. Lord Mfg Co, 1635 W. 12th St, Erie, Pa.

● **SERVICE FITTINGS:** Bulletin 656, 4 pages, presents data and illustrations on diecast aluminum service fittings for high and low tension service. Walker Bros, Conshohocken, Pa.

● **UNDERFLOOR SYSTEMS:** Bulletin 756, 8 pages, covers duct, raceway and header duct systems for underfloor electrical distribution. Walker Bros, End & Hector Sts, Conshohocken, Pa.

● **CUSTOM TRANSFORMERS:** Engineering specifications for line of custom transformers and their applications are described in 26-page catalog. Nothelfer Winding Laboratories, Inc, 111 Albermarle Ave, Trenton, N. J.

● **OVENS:** Catalog "Ovens for Industry," 36 pages, includes special ovens for motor stator baking, armature baking and pit type varnish baking oven for large stators. Kirk & Blum Mfg Co, 3120 Forrer St, Cincinnati, Ohio.

● **ELECTRONIC DATA:** A 64-page Electronic Data Handbook is a collection of often needed formulas and data used in radio and industrial electronics. Allied Radio Corp, 100 N. Western Ave, Chicago 80, Ill.

● **SMOKE CONTROL:** Revised Brooke Smoke Density System is described in Data Sheet 10.14-2a. Minneapolis-Honeywell Regulator Company, Wayne & Windrim Aves, Phila. 44, Pa.

● **GAS DETECTION:** Specification sheet on J-W Models E and EE for combustible gas detection gives features, operational and construction data, applications. Johnson-Williams, Inc, Box 6, Station A, Palo Alto, Calif.

● **EXCITATION SYSTEM:** "McHenry Excitation System, an advance in the technique of alternator regulation and control," is presented in Bulletin 5.08, 8 pages. Electric Regulator Corp, Pearl St, Norwalk, Conn.

● **VESSEL MANHOLES:** Manhole and handhole fittings for tanks and pressure vessels are described in bulletin. Colorado Fuel & Iron Corp, 575 Madison Ave, New York 22, N. Y.

● **POLE LINE HARDWARE:** Complete line of pole line hardware is described in cross-indexed Price List PH8-56, 24 pages. Malleable Iron Fittings Co, Pole Hardware Div, Branford, Conn.

● **AMPLIDYNE CONTROL:** Bulletin GEA-6497, 4 pages, features amplidyne control system for gearless elevators. General Electric Co, Schenectady 5, N. Y.

(*More Catalogs on page* 244)

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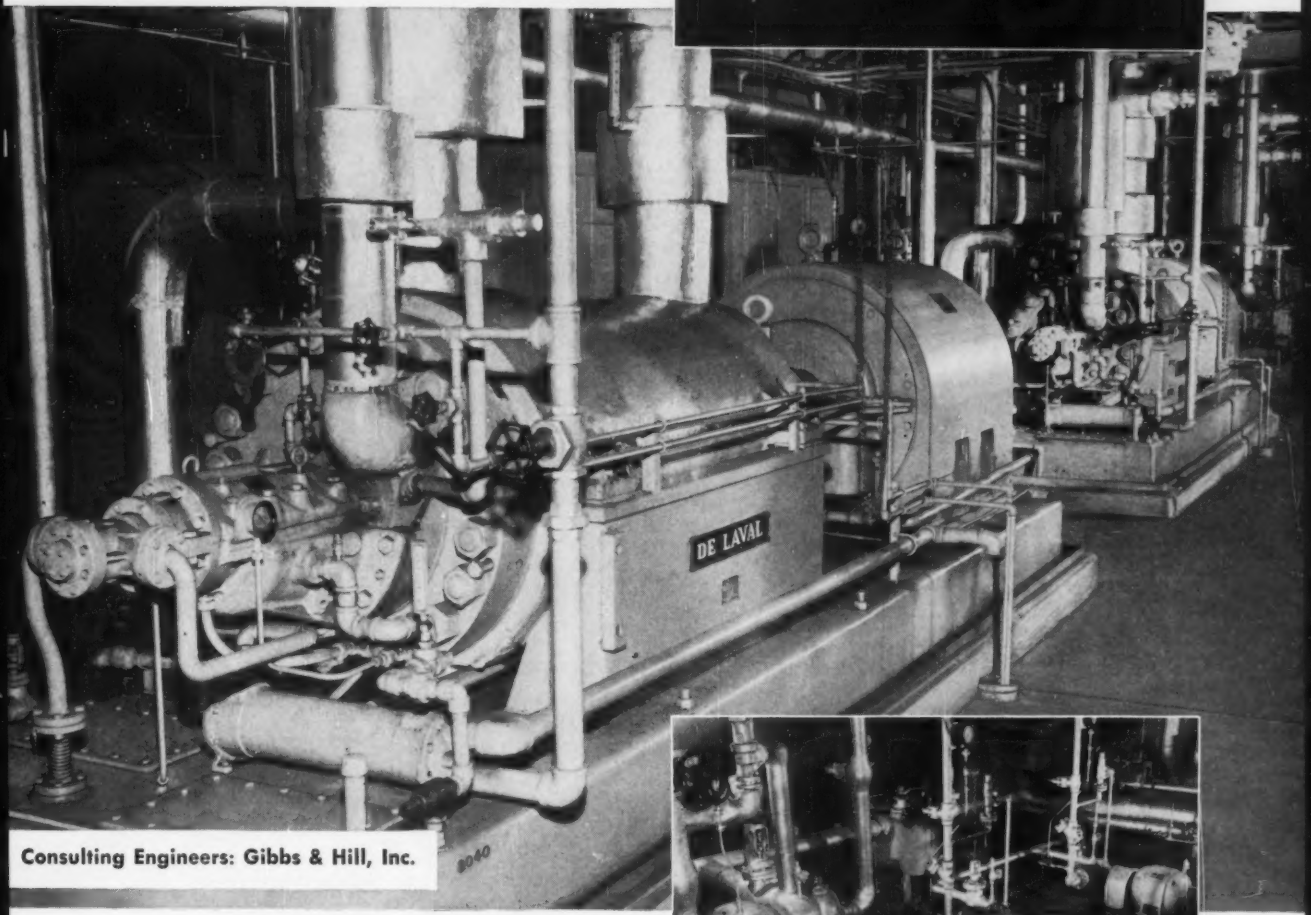
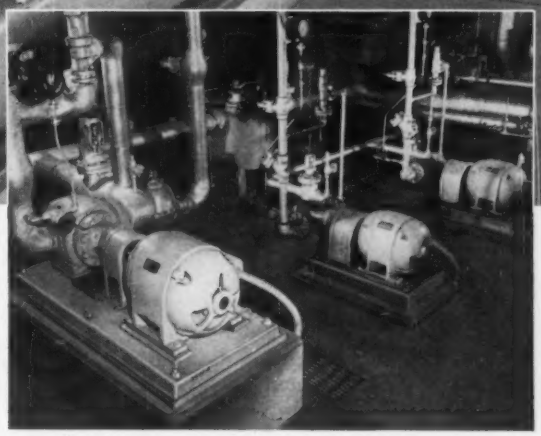


Consulting Engineers: Gibbs & Hill, Inc.



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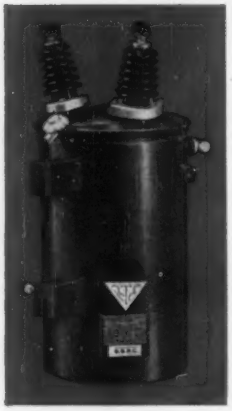

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Equipment to help provide power for America

Catalogs—Bulletins

(*Continued from page* 240)

● **INSULATIONS, OTHER PRODUCTS:** A 52-page product handbook describes applications, properties, specifications and other data on insulations, electrical products, building materials and other items. Johns-Manville, 22 E. 40th St, New York 16, N. Y.

● **OVERHEAD SYSTEMS:** Principal components of overhead materials handling systems, track design and flexible support are included in Booklet 2008-M, 12 pages. Cleveland Crane Engineering Co., Wickliffe, Ohio.

● **TRANSISTORS:** Publication GP-71, a package of brochures, contains specification information on manufacturer's 17 standard entertainment transistors and application notes on transistor audio amplifiers. General Electric Co, Semiconductor Products Dept, Syracuse, N. Y.

● **MOTION PICTURES:** Case histories, data on films and camera equipment are included in bulletin "High Speed Motion Pictures at the Service of the Engineer," 10 pages. Eastman Kodak Co, Professional Goods Div, Rochester 4, N. Y.

● **RACEWAYS:** Booklet 18-166, 14 pages, contains step-by-step illustrated installation details recommended for plastic-coated rigid steel conduit and electrical metallic tubing. General Electric Co, Bridgeport 2, Conn.

● **HOLLOW ALUMINUM BAR:** Details on hollow aluminum bar stock include tolerances, mechanical properties and applications. Tables of standard sizes available in round and hexagonal stock list wall thickness, dimensions, and weight per foot; 8 pages. Harvey Aluminum, 19200 S. Western Ave, Torrance, Calif.

● **B-B TRANSFORMERS:** Diagrams, mechanical data and ways in which "Handi-Auto" transformer are said to help solve voltage correction problems are described in Bulletin 61B8490, 4 pages. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

● **LIGHTING:** A 20-page booklet describes applications of "Sylvan-Aire," a system of wall-to-wall lighting. Designed for industrial, commercial and institutional use, system features functional treatment of sight, sound and styling. Booklet includes installation instructions, vari-space and uni-space suspension, and other data. Sylvania Electric Products Inc, 48th St, Wheeling, W. Va.

● **RANGE CONTROL:** Bulletin RT-771 explains and diagrams operation of Model TE control for top-element range temperature regulation. Robertshaw-Fulton Controls Co, 110 E. Otterman St, Greensburg, Pa.

● **MOTORS:** Bulletins GEC-1026A and GEC-1027A, each 11 pages, give buying information, including application data and ratings, for fractional hp motors, integral-hp polyphase and single phase induction motors, motors and control for part-winding starting, gear motors and resilient-base integral-hp induction motors. General Electric Co, Schenectady 5, N. Y.

● **SHORT ARC LAMPS:** Applications of short arc lamps in searchlight, projection and optical service are detailed in Booklet CE-556, 8 pages. Included are mercury and mercury-xenon types, technical data, and typical brightness curves. Westinghouse Electric Corp, Lamp Div, Bloomfield, N. J.

(*More Catalogs on page* 247)

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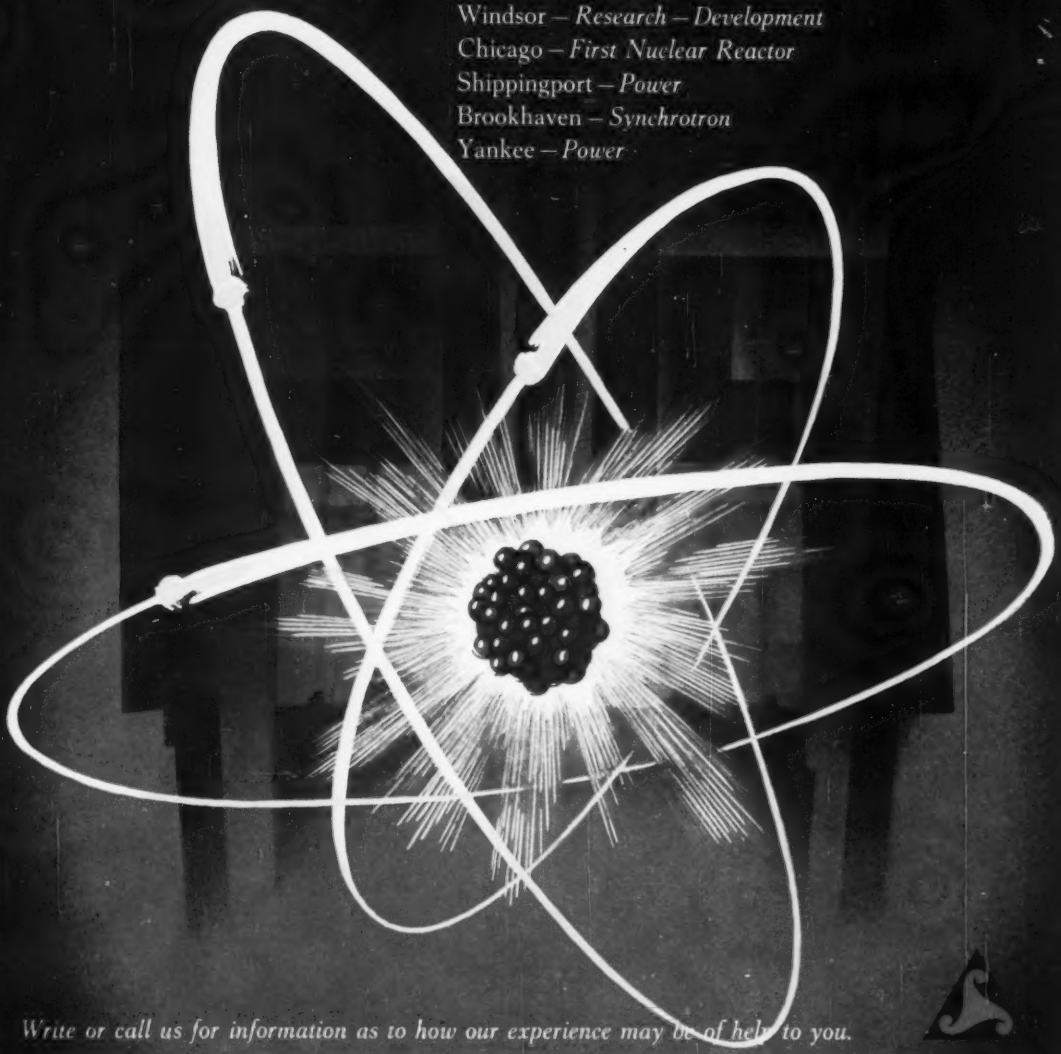

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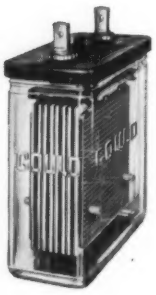

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CATALOGS—BULLETINS

(*Continued from page* 244)

● **FITTINGS, FLANGES:** Line of carbon, alloy and stainless steel seamless welding fittings and forged steel flanges is given in Folder FB-502, 6 pages. Babcock & Wilcox Co, Beaver Falls, Pa.

● **CHECKS, TAGS:** Illustrative, descriptive and technical data on metal checks, tags, plates, signs and badges are given in "Checks & Tags by Matthews" catalog. Jas. H. Matthews & Co, 3942 Forbes St, Pittsburgh 13, Pa.

● **TUBING SUPPORTS:** Bulletin 656-G, 20 pages, explains features, and lists data on tubing and piping support system. P-W Industries, Inc, Duncan & Melrose Sts., Philadelphia 24, Pa.

TECHNICAL LITERATURE

FRACTIONAL HP MOTORS: Characteristics, performance ranges, and speed-torque curves for basic motor types are detailed in Motor Selector Chart. Howard Industries, Inc, 1760 State St, Racine, Wis.

ALUMINUM CONDUCTOR—Kaiser Aluminum and Chemical Sales' technical manual, provides data on the physical properties and electrical characteristics of all sizes and strandings of aluminum conductor, information pertinent to the application of such conductor to overhead distribution systems, etc. There is also an index of industry specifications, a section on construction suggestions, and notes on the increasing role that aluminum is playing in the electrical industry. Hard cover, 192 pages. Write 919 N. Michigan Blvd., Chicago 11, Ill.

COPPER, TEMPERATURE EFFECTS—American Society for Testing Materials has issued "Elevated-Temperature Properties of Coppers and Copper-Based Alloys", a repert of a joint ASTM-ASME Committee on the Effect of Temperature on the Properties of Metals. Primarily, it is a graphical summary of the elevated temperature data for coppers and copper-based alloys. Data for the coppers are limited to the wrought materials; that of the alloys to cast and wrought materials. Graphical data includes modulus of elasticity, tensile strength, yield strength, reduction of area, elongation, stress for creep rates and stresses for rupture. An appendix gives the original data for drawing curves. Price, $5.50. Write 1916 Race St, Philadelphia 3, Pa.

FARM WIRING — "Specifications for Farmstead Wiring," a 16-page booklet published by the Farm Wiring Subcommittee of the Farm and Rural Market Development Committee of the National Electrical Manufacturers Association, is available from the Farm Electrification Bureau in the following price ranges: 10 to 99 copies, 15¢ each, 100 to 999 copies, 13¢ each, and over 1,000 copies, 11¢ each, all prices excluding postage. The booklet discusses safety, specifications for wiring (exterior and interior), grounding, materials, and electrical service contracts. In the last instance, a typical contract is included. Write 155 E. 44th St, New York 17, N. Y.

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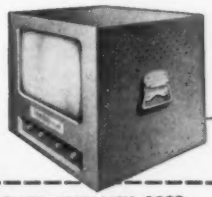

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A cheap, easy, strong joining method for ACSR with single-core wire

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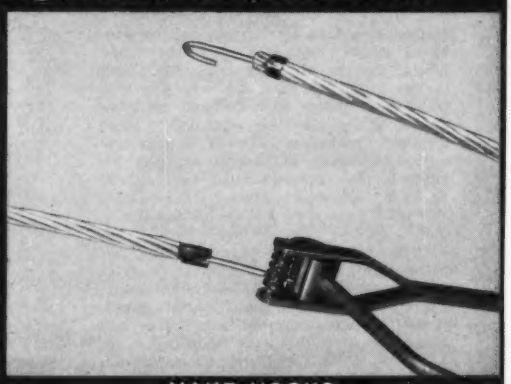
Try using a tubing cutter to score the aluminum strands, then snap them off. It's quicker. Or trim back conventionally.



MAKE HOOKS

Push core wire into proper size hole, close handles, and a perfect hook is made. Simplicity plus. Technique is learned in a minute.

Alcoa Hook-Forming Tool locks ACSR cores together

- **Cuts joint cost up to 42%**
- **Pays for itself in a few joints**
- **Eliminates steel sleeves**

Now, sub-transmission and distribution ACSR can be joined easily, quickly and cheaply. The Alcoa® development that makes this possible is the new hook-forming tool.

This tool forms perfect hooks in the steel core—in seconds. Cores are hooked together, clinched, and the aluminum sleeve is centered over the joint and compressed. The connection is strong—more than 95% of conductor strength—and possesses low electrical resistance.

Compared to the usual ACSR double-sleeve joint method, this new method is considerably cheaper. For example, on #4 ACSR, the hook former cuts material costs of the joint by 42%—a few joints and the tool is paid for. The need for stocking and carrying steel sleeves, and the dies for them, is eliminated.

The hook-joint method saves time and annoyance, too. When the cores are hooked together and clinched, the conductor is self-supporting.

Hook joints are made in ACSR sizes #6 to 2/0, inclusive, and other conductor with similar core sizes. Tool weighs only 1½ pounds and is small enough to be carried on a belt or in a pouch, yet is ruggedly built for rough service.

Ask your Alcoa representative to demonstrate this new cost-saving tool, or write Aluminum Company of America, 2306-J Alcoa Bldg., Pittsburgh 19, Pa.

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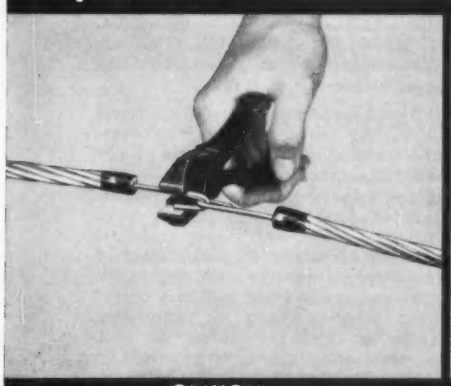
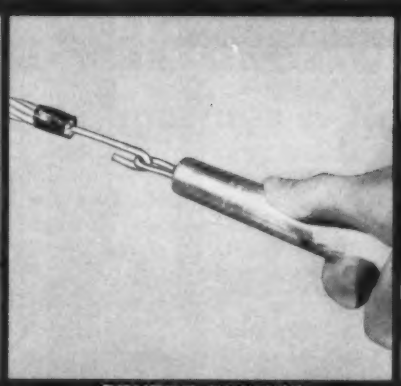
joints in sub-transmission and distribution ACSR



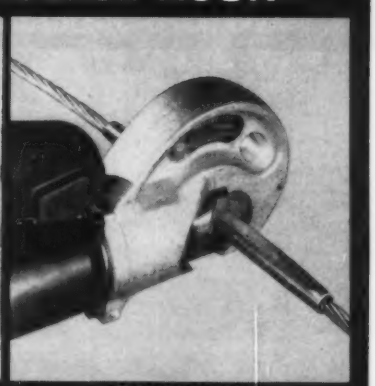
CLINCH

Hook cores together and clinch each hook with pliers. Conductor is then self-supporting and core wires are in exact position for compression operation.



CENTER SLEEVE

Center the aluminum sleeve over the joint. With the hook joint, steel sleeves and their dies are eliminated.



COMPRESS

Last step is to compress the aluminum sleeve. The Alcoa 12-A Compressor, combining 12 tons of compression in a light hand tool, is recommended.

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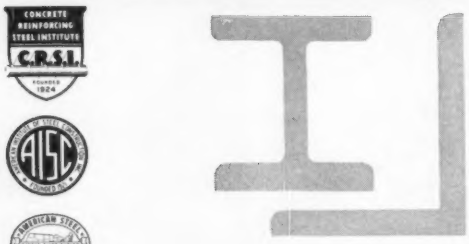

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BOOKS

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Linear Transient Analysis. By Ernst Weber. Published by John Wiley & Sons, Inc., 440 Fourth Ave, New York 16, N. Y. 452 pages, illustrated. Price $10.50.

Mathematics for Electronics. By Henry M. Nodelman and Frederick W. Smith. Published by McGraw-Hill Book Co., 330 W. 42nd St, New York 36, N. Y. 391 pages, illustrated. Price $7.00.

Engineering As A Career. By Ralph J. Smith. Published by McGraw-Hill Book Co., 330 W. 42nd St, New York 36, N. Y. 365 pages, illustrated. Price $4.75.

RI and TVI Suppressed

Electrical Interference. By A. P. Hale. Published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. 127 pages, illustrated. Price $4.75.

Electrical interference with radio and television reception has been a major problem to the British General Post Office which received 140,000 complaints in 1954 alone. Analysis of the causes and effects of this interference, and methods for eliminating it, are covered clearly and simply in this book. Correctives range from improvement of the antenna system to locating the source of interference and applying filters or screens to suppress it.

Electric utilities in America are frequently called upon to investigate and suppress similar interference. Their engineers would improve their understanding of the problem by study of this British book.

Estimating Guide Revised

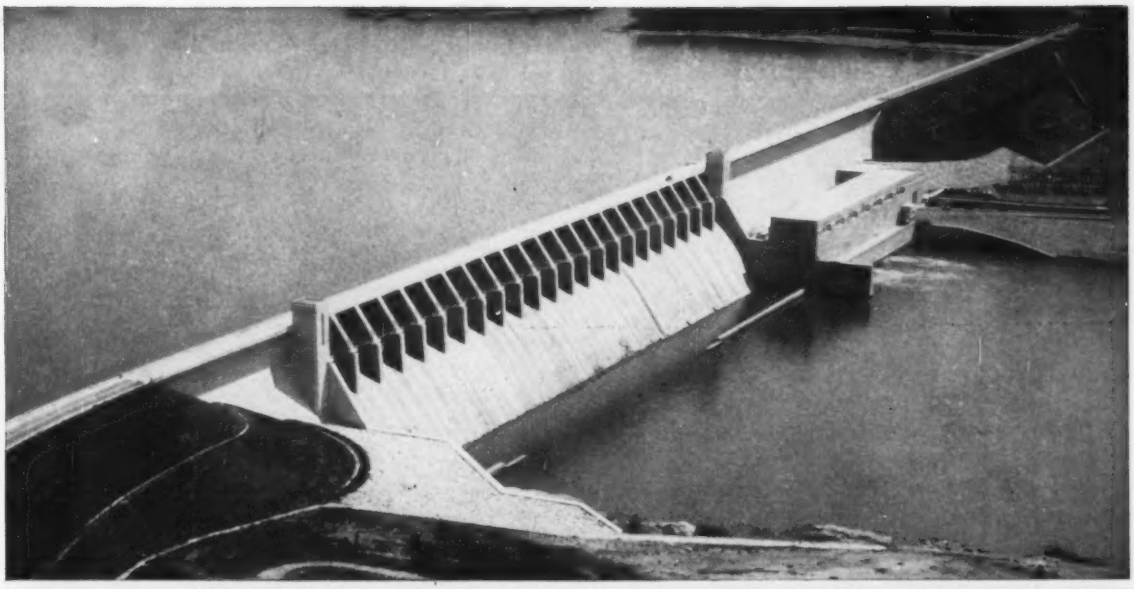
Electrical Estimating—2nd Edition. By Ray Ashley. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St., New York 36, N. Y. 363 pages, illustrated. Price $8.00.

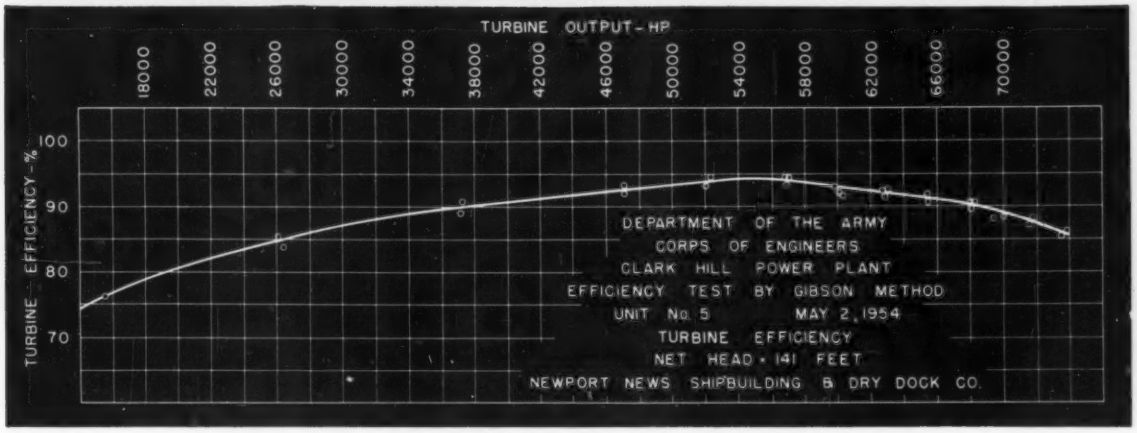
All important elements of electrical estimating are covered, from selection and training of estimators and proper use of estimating tools to the cost of preliminary estimates and preparation of final bid sheets. The book includes sample estimates, methods of checking estimates, preparation of labor cost units, how to figure mark-ups, and many other pointers useful in solving problems of estimating, appraisal, cost accounting, and job scheduling.

Revisions in this second edition include an entirely new section about labor units. This section includes over 500 price units. Besides the 1955 unit costs, older figures are retained for aid in appraising established installations.

Questions and answers on every

(*Continued on page* 254)





Maximum efficiency of 94.1%

Reflects advanced practices at Newport News

THE GRAPH shows performance of a 55,000 horsepower turbine, one of seven such units built by Newport News for the Clark Hill Power Plant (see photo).

Shape of the curve is typical . . . not exceptional . . . for Newport News turbine performance. Regular, uniform, showing no-cut-off at full load, it indicates consistent delivery and stable operation.

And especially, experience in design and model testing.

At Newport News, turbine runners are continually being designed and redesigned for improvements in performance. And often upon receiving a contract for turbines, a model setting is built and complete tests made. So far, Newport News has filled turbine contracts with an aggregate rated output in excess of 7,000,000 horsepower.

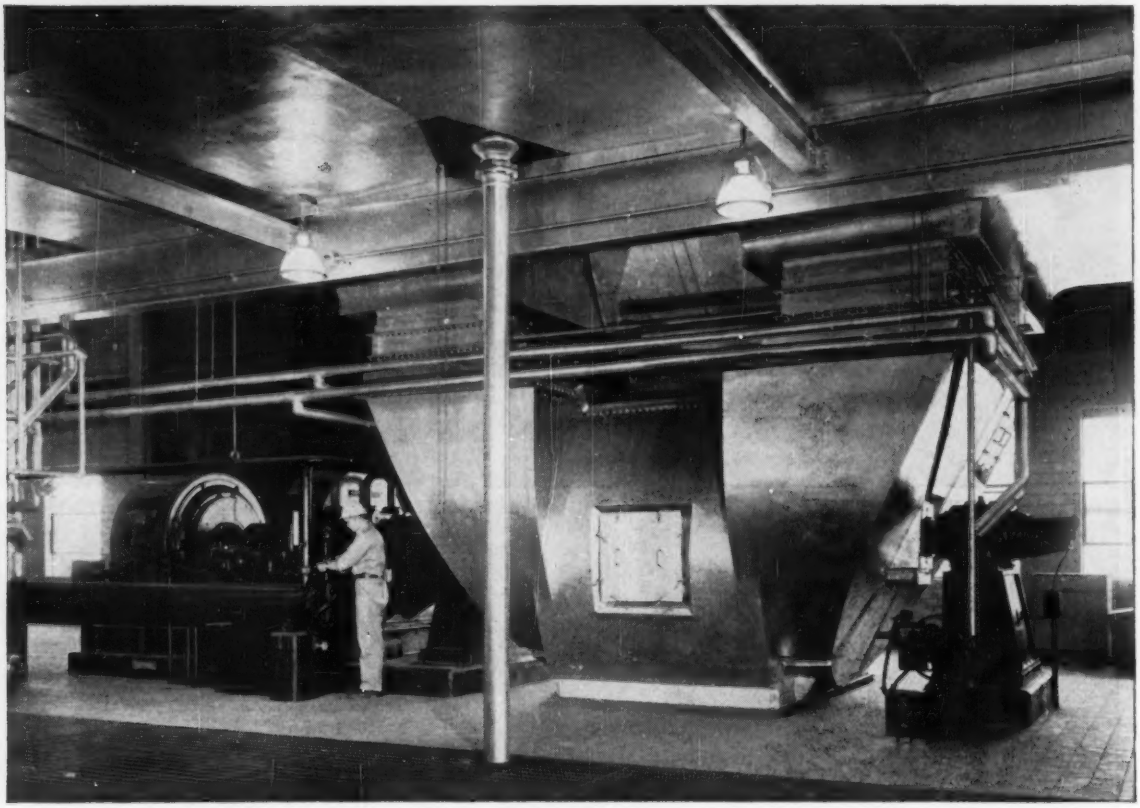
Penstocks, spiral casings, valves, pumps, rack rakes and other essentials are also designed and built by Newport News. Our illustrated booklet, "WATER POWER EQUIPMENT," will be sent to you upon request.

Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News

Shipbuilding and Dry Dock Company
Newport News, Virginia

American Blower Mechanical Draft

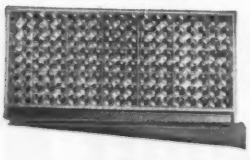


American Blower Induced Draft Fans meet the rigid requirements of modern power plants, where maximum pounds of steam are constantly produced at peak efficiency. Here are a few of the many features they offer:

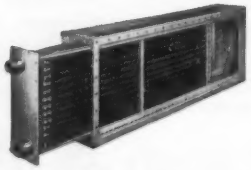
- High static efficiency, low R.P.M.
- Minimum boiler "outage"
- Certified ratings, minimum maintenance
- Minimum space requirements

To meet your exact specifications and ensure reliable performance, American Blower mechanical draft equipment is accurately formed and welded, fan rotors are perfectly balanced and tested, and all final assemblies are minutely inspected.

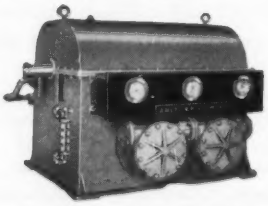
Other American Blower Heavy-Duty Equipment for Power Plant Applications



Collectors and precipitators for dust and fly ash control

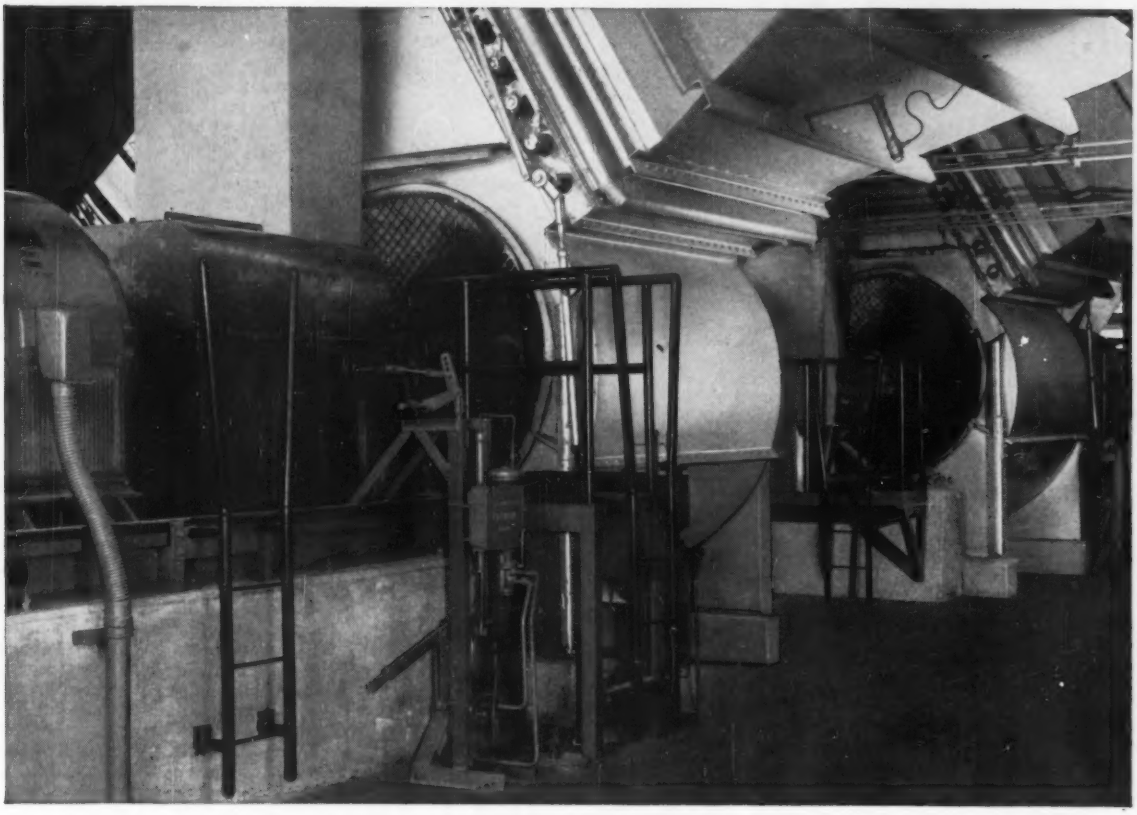


Heavy-duty steam coils for high-pressure duty



Gyrol Fluid Drives for boiler feed pump and fan control

Fans meet peak-efficiency standards



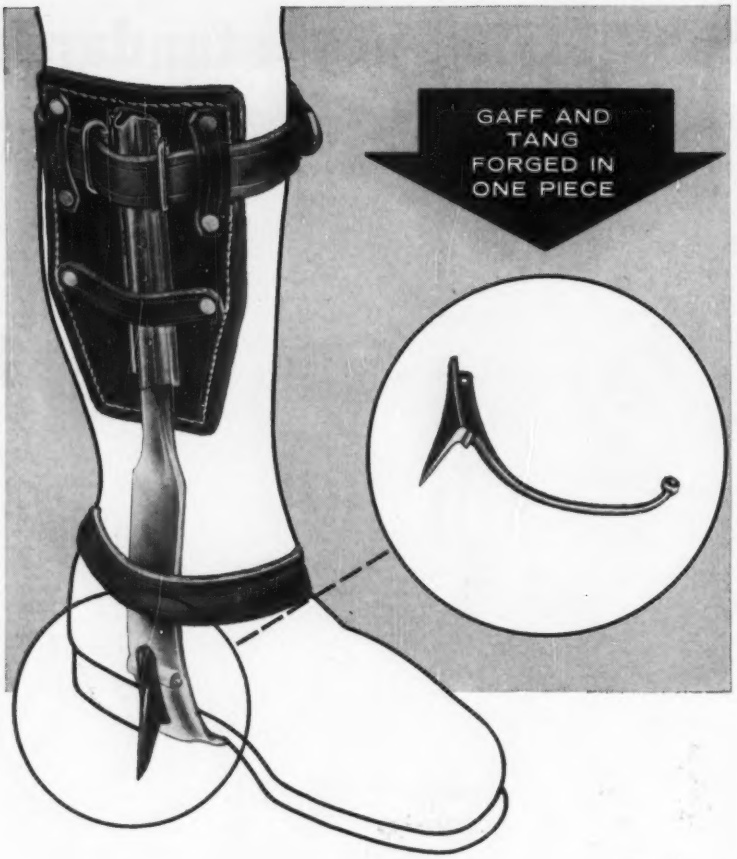
American Blower Forced Draft Fans are suitable for either indoor or outdoor installations. Each type of fan is carefully developed and its performance-rating guaranteed. Here are some of the reasons why American Blower Forced Draft Fans are widely accepted by power plants throughout the nation:

- Certified ratings
- Heavy reinforced housings and wheel-shaft assembly designed with first critical well above maximum operating speed
- Special streamline inlets designed for all wheel types to obtain high efficiency
- Choice of bearings to fit any application

If your plans include mechanical draft equipment—for new installations or as replacements—consult your American Blower sales engineer. He can give you helpful information on job-fitted American Blower equipment to meet your power plant requirements. Call our nearest branch office or write: American Blower Corporation, Detroit 32, Michigan. In Canada, look for Canadian Sirocco products.

AMERICAN BLOWER

Division of American-Standard



Here's why M-S-A–Brooks Adjustable Climbers provide greater safety–durability

Gaff and tang forged in one piece! That's a statement that makes plenty of safety-sense to workers who depend on a small "tooth" of steel to support their weight high above the ground. This feature is exclusive with the M-S-A–Brooks Adjustable Climbers. And there's more to the story. The gaffs and leg irons are forged from high quality, medium carbon steel, heat treated to assure the proper balance of hardness, toughness and ductility.

Inspection plays an important role, too. Every leg iron and gaff is examined by the magnetic particles method. Statistical sampling is used for impact, absorption, Rockwell hardness and metallurgical tests. And all this means greater safety, longer wearing qualities . . . less maintenance.

Pads and straps are made of top grain steer hide with chrome leather reinforcement on the leg side of the calf pad. The result—maximum comfort on the job.

Write for complete details.

MSA
SAFETY EQUIPMENT HEADQUARTERS
Call the M-S-A man on your every safety problem . . . his job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States
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Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S. • Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

Books

(*Continued from page* 250)

section of the book help make it an ideal volume for self training. The book is very thorough in its treatment, making excellent use of charts, diagrams, and examples. The majority of projects discussed deal with residential, light industry, or commercial establishments.

Standardizing Electronic Circuits

Handbook: Preferred Circuits, Navy Aeronautical Equipment, NAVAER 16-1-519. **By J. H. Muncy. Prepared by National Bureau of Standards. Published by Government Printing Office, Washington 25, D. C. 191 pages, illustrated. Price $1.75.**

Compiled by the National Bureau of Standards under sponsorship of the U. S. Navy Bureau of Aeronautics, this book contains a wealth of tested and desirable electronic circuitry. Primary objective is to encourage better engineering and faster, cheaper production for military electronic equipment by standardization on circuit elements of proven performance.

Some of the 32 circuits are peculiar to radar and other military specialties. But many are applicable to commercial electronic control, communication, and testing equipment. The simplicity and clarity with which these circuits are presented would make the book valuable to utility engineers whose duties include electronic applications and to manufacturers who supply the equipment.

Testing Electrical Machines

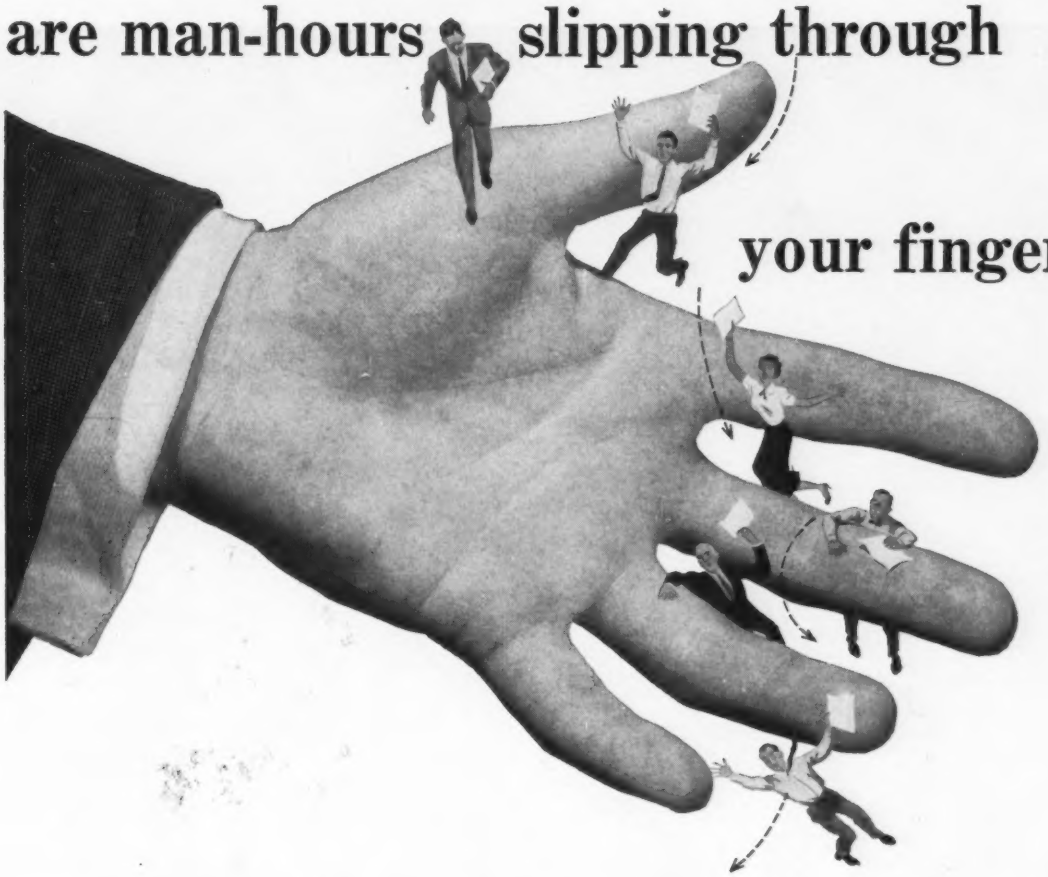
Die Prufung elektrischer Maschinen—3rd Edition. By W. Nurnberg. Published by Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 423 pages, illustrated. Price DM 29.40.

Adaptation of the dc generator to amplifier and control service spurred extensive revision of this book. In this new 3rd edition 58 pages are devoted to the so-called "transverse field" generator. With this addition, and revisions of its earlier contents, the book is a valuable reference and guide to the testing of elctrical machinery.

The author's concept is that testing begins in manufacturing, is repeated during construction, and continues for the service life of a machine. To this end he has prepared a text for technical students and practicing engineers which includes not only the test techniques but extensive information about instrumentation, calculations, and characteristics.

Utility engineers who conduct or interpret equipment tests would gain broader knowledge through study of the book and application of its philosophy to their work.

are man-hours slipping through your fingers?



P-A-X "inside" communication cuts this loss

60 LEADING POWER COMPANIES
are saving man-hours every day with P-A-X Telephone Systems. Here are just a few:

Dayton Power and Light Company, since 1951, 300 telephones
Central Illinois Public Service Company, since 1939, 175 telephones
Wisconsin Power and Light Company, since 1932, 125 telephones
Duquesne Light Company, since 1922, 1057 telephones
Public Service Company of Indiana, since 1943, 200 telephones
The Detroit Edison Company, since 1950, 141 telephones
Jersey Central Power and Light Co., since 1935, 31 telephones

When your people are walking about to exchange information, they're *wasting time.* What you need, in your headquarters building—your division offices—and out along the line, is a P-A-X Business Telephone System. It provides point-to-point communication—in *seconds.* The P-A-X system makes it easier to supervise and coordinate all utility operations, and keep things moving at top efficiency.

Rent-free, P-A-X systems are privately owned and controlled; your own maintenance men install and move P-A-X telephones as you wish. Entirely separate from the public telephone system, P-A-X gives you lightning-fast service, always—no matter how busy the city switchboard may be.

Discover how other utility companies are saving time and increasing efficiency with a P-A-X Business Telephone System. One of our communication specialists will call on you and give you the complete story, with no obligation on your part. *Write:* Automatic Electric Sales Corporation (HAymarket 1-4300), 1033 West Van Buren Street, Chicago 7, Illinois. *In Canada:* Automatic Electric Sales (Canada) Ltd., *Offices in principal cities.*

P-A-X *business telephone systems*

AUTOMATIC ELECTRIC

Originators of the dial telephone • Pioneers in automatic control

GENERAL TELEPHONE SYSTEM

dark . . . storming . . . trouble above . . : clear below

DOW

Dow weed and brush killers take the "expense" out of emergencies

RIGHT OF WAY wide and clear—ready for any emergency. Chemical weed and brush control meant this repair team arrived safely and quickly —and reduced your outage time.

Chemicals reduce line maintenance costs, too. Neater, longer-lasting and faster than cutting.

It's common sense to select the most effective control available . . . it's economically basic to consider *first* the cheapest way. Dow Brush and Weed Killers were developed to meet these qualifications . . . and typically, with Dow you have chemicals specifically designed for easy use, safe application, and your specific vegetation problem.

Special chemicals for brush, grass. Use Esteron® 245, Kuron® or Esteron Brush Killer on trees and brush. Here's hard-hitting power for effective control. Use Radapon*, containing dalapon sodium salt, for grass control. Works through leaves but kills roots, too.

Baron—simple, complete weed control. Use Baron* for control of both broad and narrow-leaved weeds. It's ideal for use around substations, storage areas and plant sites.

Application techniques are simple. Your own crew can do the job.

We'll be glad to send cost figures showing how other people saved money using Dow selective herbicides. Write THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemical Sales Department, Midland, Michigan.

*Trademarks of The Dow Chemical Company

you can depend on DOW AGRICULTURAL CHEMICALS DOW

COPE EXPANDED METAL CABLE TROUGH THE LOWEST INSTALLED COST OF ANY CABLE SUPPORTING SYSTEM

Cope Expanded Metal Cable Trough is installed in 90% of all major U. S. utilities and is used widely throughout industry.

Note these advantages that are unique with Cope Expanded Metal Cable Trough:

Labor Savings. Quick, simple connections mean faster installation, reduced labor costs. Exclusive Cope Pin-Type Coupler uses only two steel pins and a bottom plate per connection.

Materials Savings. Since far less steel is required than for most types of supporting systems, you save quantities of steel. And fewer, lighter supports are needed.

Improved Electrical Properties. Cope Expanded Metal Cable Trough allows higher cable current ratings. Some engineers allow free air ratings, and all allow higher ratings than are permitted with a solid, enclosed support.

Maintenance Savings. Cable is available for inspection and repair when it is laid in Trough. Insulation is saved by allowing the generated heat to escape and also by greatly reducing frictional wear when cable is installed.

Greater Flexibility. Cope Trough is the most flexible system of cable supports ever designed. A complete line of standard fittings simplifies side runs, drop-outs, last minute changes, plant expansions.

Space Savings. Cope Trough saves space by reducing materials. Confusion is reduced during installation because connections are simpler.

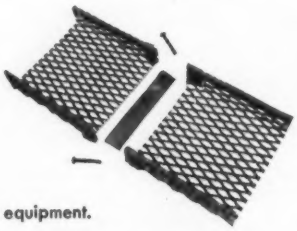
Other Cope Products to Help Simplify Your Jobs:

Cope Cable Ladder is the simplest and least costly system for the support of armored and other semi-rigid cables.

Cope Cable Channel for branch runs is readily tied in with Trough or Ladder System. Both Ladder and Channel incorporate exclusive Pin-Type Coupler.

Cope Rakit Supports are designed specifically for the support of Cope Ladder, Channel, and Trough Systems. Available either with trapeze or the more popular cantilever supports.

EXCLUSIVE COPE PIN-TYPE COUPLER
greatly simplifies installations, reduces installation costs, and provides greater adaptability. Pin is driven into interlocking barrels and rigidly secures the connections. Bottom plate protects cable at Trough connections.



Cope Standard Line
is a complete line of underground cable installation equipment.

Specify Cope Products for Quality. Our engineers are ready to work with you.

T. J. COPE, INC.
COLLEGEVILLE 4, PA.

Cope

GROUND TENTS

ROD GRAPPLES

CABLE REEL JACKS

PNEUMATIC FISHLINE

Area Development

Workshop, sponsored by EEI, to open in Minneapolis Oct. 3 for utility personnel

Edison Electric Institute's Area Development Committee will hold its third workshop Oct. 3 in Minneapolis. Under the general theme of "Planned Progress Through Area Development," delegates will hear eight speakers and will participate in seven panel discussions.

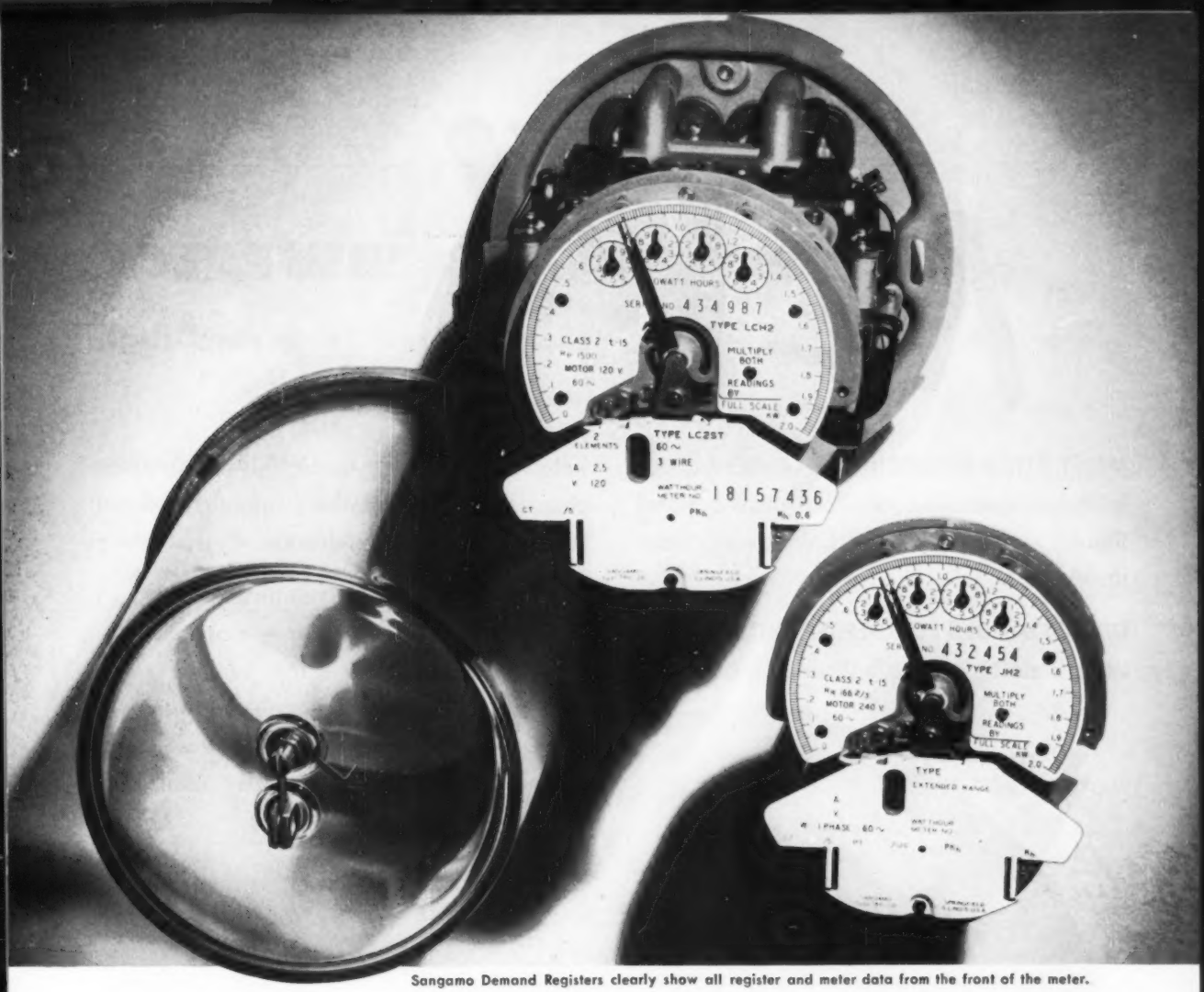
"Area Development and the Electric Utility Industry" will be discussed by Edwin Vennard, vice president and managing director, EEI. Herbert H. Smith, executive director of Community Planning Associates, Inc, will give practical approaches to regional planning.

Several approaches to community planning is the subject of a panel discussion, to be moderated by Herbert H. Smith.

Other panels and their moderators include: "Getting Started in Area Development," (moderator to be named); "Publicity and Direct Mail Campaigns," Clark P. Spellman, Virginia EL&P Co; "Research," A. V. K. Babcock, Arizona Public Service Co; "What Part of Area Development Must the Community Do for Itself," William H. Kennedy, Jr., Arkansas P&L; "How to Work with Cooperating Agencies," William J. Jameson, General Public Utilities Corp, N. Y.; and "Financing Industrial Growth," Frederick Herr, Jr, Central & South West Corp, Chicago.

Other speakers include Aime V. Carkhuff, past national president of the Society of Industrial Realtors, whose topic will be "Allies and Their Responsibilities in Industrial Development Programs;" Allen S. King, president, Northern States Power Co, speaking on "Friendly Enemies;" Dr George C. Smith, vice president and economist, F. W. Dodge Corp, on "The Industrial Outlook;" Dr John Borchert, University of Minnesota, on "Outlook for Major Shifts in Resources Development;" Thomas R. Reid, director of civic affairs, Ford Motor Co, on "Sales Techniques Used by Successful Area Developers;" and Dr Arnold H. Lowe, pastor, Westminster Presbyterian Church, Minneapolis, on "The Worth of a Man."

(*Continued on page* 262)



Sangamo Demand Registers clearly show all register and meter data from the front of the meter.

for low-cost mechanical demand metering use SANGAMO Demand Registers

- **Mechanical Demand Registers . . . both singlephase and polyphase.**
- **Can be field-installed on any modern Sangamo Watthour Meter.**
- **Require no lubrication. No preventive maintenance problems.**

Any modern Sangamo Watthour Meter can be quickly converted to a demand meter by replacing the standard register with a Sangamo Demand Register.

Sangamo Demand Registers are built to give many years of consistently accurate readings. Service experience has proved them capable of extremely long periods of troublefree operation.

This long service life is due to: 1. The Sangamo slow-speed (450 rpm), high-torque motor. 2. Timing gear shafts with hardened, polished stainless steel pivots which turn in vacuum-impregnated porous bronze bearings. 3. The use of jewelled and nylon thrust bearings. 4. The dependable, clutch-free gravity reset mechanism.

For more information, write for Descriptive Bulletins 311 and 312 and for Service Manual 390.

Live Better Electrically

SANGAMO

SANGAMO ELECTRIC COMPANY

Springfield, Illinois

SM56-9

NEW! "BUFFALO"

a new high

MOST STREAMLINED INLET — note smooth inlet bell matching the deep drawn wheel flange to form a "true half circle" inlet into wheel.

DEEPER BLADES FOR DEEPER "BITE" — note exceptionally deep blade design in photo below. This improves air flow thru blade channels. Flanged hubs—smoothly curved for best air entry conditions.

The wheel has been dynamically tested in the "Buffalo" Vacuum Pit — possible only at "Buffalo". By spinning various rotor designs to destruction the optimum wheel construction was determined — another "Buffalo" "Q" factor.*

"Buffalo" Air Foil Wheel. Note "deep-bite" blades for most efficient air handling.

**The "Q" Factor — the*

BUFFALO

BUFFALO,

Canadian Blower &

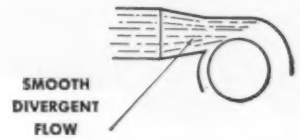
VENTILATING AIR CLEANING AIR TEMPERING PRESSURE BLOWING

"Deep Blade" AIR FOIL FANS

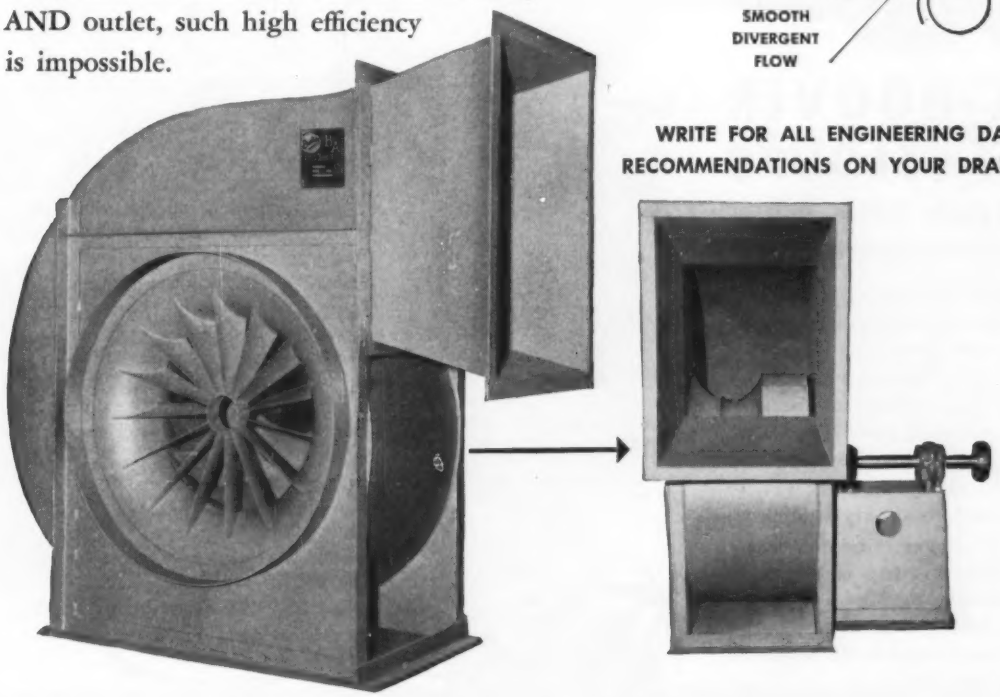
in forced draft performance

IMPROVED FAN OUTLET — reduces outlet air turbulence from fan cutoff into duct by making more even, gradual change from velocity to static pressure. Without this complete streamlining of inlet, housing AND outlet, such high efficiency is impossible.

92% MECHANICAL EFFICIENCY — not an inflated claim, but proved performance you can expect in field operation.



WRITE FOR ALL ENGINEERING DATA AND RECOMMENDATIONS ON YOUR DRAFT PROBLEM



built-in Quality which provides trouble-free satisfaction and long life.

FORGE COMPANY

"Buffalo"

NEW YORK

Forge Co., Ltd., Kitchener, Ont.

INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING

How to Earn
EXTRA DOLLARS
in Operating Savings

YORK-HOOVER
model 56LGU78
repair and cable maintenance body

The Model 56LGU78 Body is an exceptionally practical unit for installation and repair jobs and cable work as well.

This one man cable maintenance body or general repair unit is practical because ample drawer and shelf space is provided for carrying necessary materials and tools, while the entire body loading space is available to transport other necessary equipment.

Lightweight, yet rugged construction and functional capacity are two reasons why you should investigate the Model 56LGU78 Body Unit . . . built and backed by York-Hoover . . . a famous name in the Transportation Industry since 1892.

For the complete Model 56LGU78 story, write for Bulletin No. 938 today!

Interior of body showing installation of one man splicers unit adaptation which is available under Optional Equipment. Ladder brackets which are illustrated are Type OH78-220 for two extension ladders.

The above shows body with easily operated sliding roof, locked in closed position. Drop gate is particularly rugged for hard usage. Note optional rear bumper and LB towing hook installation.

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

Area Development

(*Continued from page* 258)

John R. Frederick, Wisconsin P&L Co will summarize the work shop at the closing session.

EEI notes that the $28 registration fee covers two luncheons, a cocktail party, dinner, and incidental workshop expenses. Delegates should make their own hotel reservations.

The Area Development Committee will hold its organizational meeting at 10 a.m., Oct. 3, Hotel Radisson, Minneapolis.

BPA Offers Dump Power to Washington State

J. Frank Ward, managing director of the Washington State Power Commission, has confirmed a report by Rep Hal Holmes (R-Wash.) that the Bonneville Power Administration has submitted a proposal for furnishing dump power to the commission to permit construction of a coal-fired steam power plant in the Roslyn-Cle Elum area.

The proposal is under study, said Ward, but details were not disclosed. Ward previously has declared that, if dump power could be obtained at an attractive rate, construction of the steam plant would be feasible.

Holmes, who represents the area in Congress, said the proposal was reported to be "generally acceptable" to the commission. He made the statement from his home at Ellensburg, Wash.

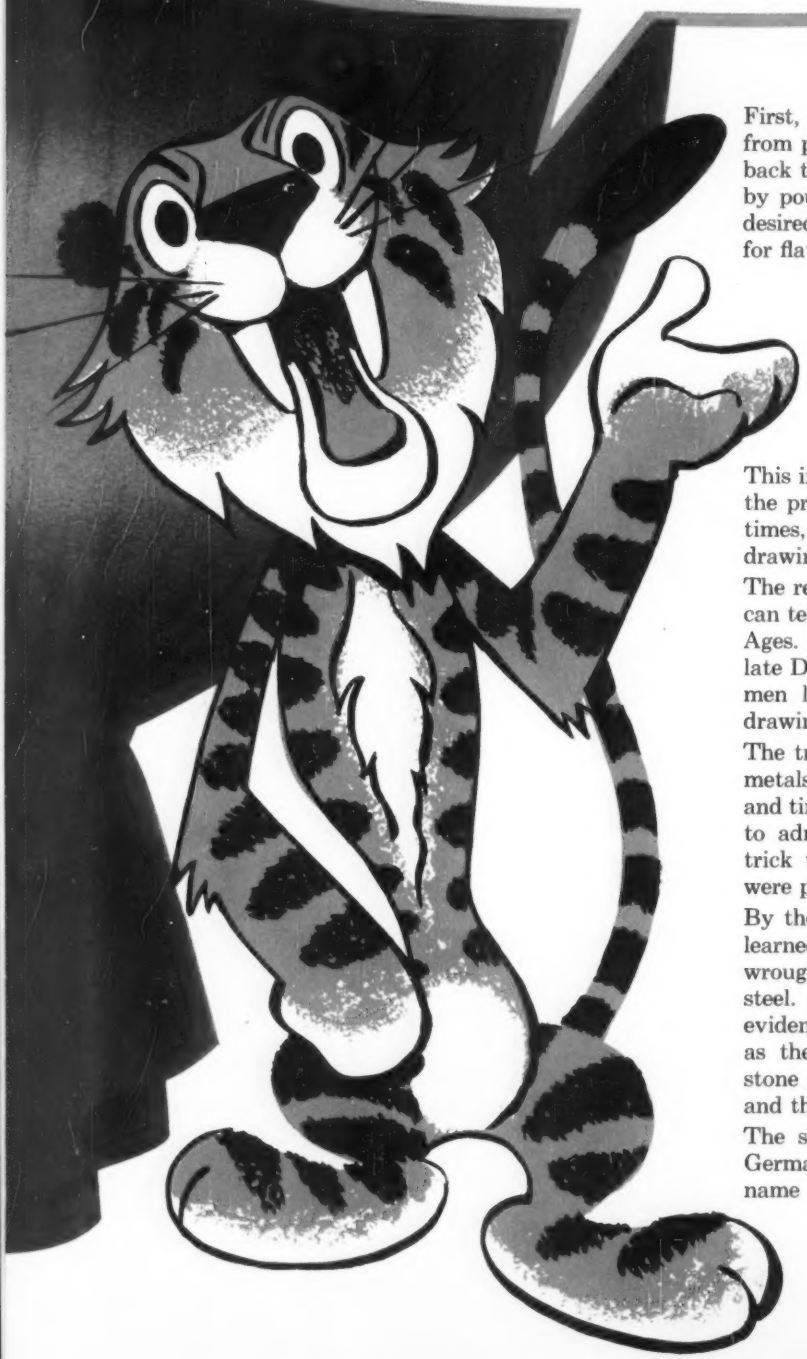
The commission has been considering plans for a 300,000-kw steam plant which would operate at least six months a year. Mines in the Rosyln-Cle Elum area are seeking new markets, with supply exceeding the demand.

New Station Planned

San Diego Gas & Electric Co's recent purchase of 145 acres of land fronting San Diego Bay will be used for a new power station in the city's South Bay area, the first unit of which will be in operation by 1960 or 1961. This unit will have a generating capacity in excess of 100,000 kw and will operate on a conventional type of steam turbo-generator.

AT LAST! An excuse
to tell
our favorite story!

Did you ever hear the incredible, staggering, marvelous story of how they learned to draw steel wire? Since this is our 125th anniversary, it seems an appropriate time to let you in on one of the most underplayed industrial dramas of all time.



First, a little background. Wire, mostly made from precious metals, has been found that dates back to the year 2750 B.C. It was usually made by pounding on a bar with a hammer until the desired shape was obtained. They usually settled for flat wire.

This inefficient production method gave chills to the production men even back in the Pharaohs' times, so the race was on to find a method of drawing wire through dies.

The records are kind of sloppy, but as far as we can tell, the big break-through came in the Dark Ages. Some authorities further refine it to the late Dark Ages; but suffice it to say that learned men like Theophilus were writing about wire drawing in the period from 800 to 900 A.D.

The trouble was that they could only draw soft metals like gold or a then-popular alloy of lead and tin which we know as solder today. You have to admit that it doesn't seem like much of a trick to draw *solder* through a die, but things were pretty tough in those days.

By the beginning of the 17th century, men had learned how to draw still harder metals, like wrought iron. But *nobody* could draw high carbon steel. Not that they didn't try. There is some evidence that men searched for a drawing process as they searched for the elusive philosophers' stone that would transmute lead into gold . . . and they met with the same success.

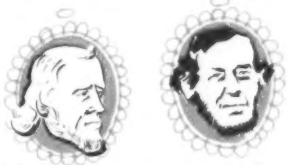
The scene shifts to the little town of Altena, Germany, around the year 1650. Our hero (his name is in dispute, but it was probably one

Johann Gerdes) had tried all sorts of wire drawing tricks. He used dozens of different die lubricants, weird types of dies, slow pulling, fast pulling, high and low temperatures. Nothing worked, so you can hardly blame him for picking up the bundle of steel rods and marching outside with them. There, he flung open the door of what might be loosely called the gents' rest room, and dumped the rods down the hatch.

Some time later, they needed more rods for the experiment, so a few hardy souls retrieved the ones that had been banished in such a dramatic manner. The rods were carried back into the little factory and they drew beautifully—the first drawn high carbon steel wire. Some profound change had taken place in the steel. They didn't know what had happened, but they liked the results.

A thriving industry grew up in Altena. And they say it was quite a sight to see the workers come in of a morning with a yoke pole across their backs, supporting a lunch bucket at one end and a common household utensil at the other—the raw materials for a day at the wire mill.

Altena enjoyed a complete monopoly on steel wire drawing for almost a century, until an obviously disgruntled worker found that dilute sour beer would also do the job. Finally, some kill-joy discovered that you could even use *water* if you did it right. The "secret" spread, and from then on, Altena had to bask in her rather impressive past glory.

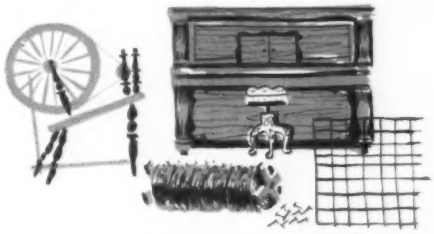


On this 125th anniversary, we think we are entitled to mention that American Steel & Wire is a highly reputable organization employing about 30,000 devoted workers who really know how to do things to wire. The original company was formed in 1831 by two live-wire gentlemen named Ichabod Washburn and Benjamin Goddard, who, if they lived in this wonderful generation, would probably own half of the United States and Canada. Brilliant as these gentlemen were, the company never really started to roll until ladies became interested in hoop skirts, because this was the first true volume market for wire!

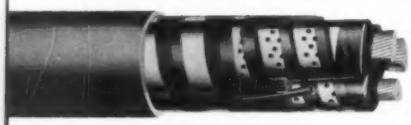
After the Civil War, the hoop skirt market went to pieces (you know how women are about fashion), and things looked pretty gloomy until barbed wire was invented around 1870. It's been one thing after another right up to the present time.

As the most knowledgeable wire maker in the USA, it was rather natural for us to begin making electrical wire and cable right at the beginning—1891 to be exact. Our salesmen frequently stumble across Tiger Brand electrical cable that has been buried in the ground or under water for 30 to 40 years and is still giving good service.

When we discuss incidents like this at our frequent sales meetings, the general comment is that our high production standards certainly don't help our replacement market very much, but fortunately, we're part of a great and growing industry. And, what with nuclear power plants and the like, there will always be a big demand for Tiger Brand Electrical Wire and Cable from buyers who want that extra margin of quality that we learned to build into our products a long, long time ago.



A brief summary of Tiger Brand Electrical Wire & Cable



TIGER BRAND PAPER CABLE

Premium quality cable for high voltage use. Lead sheaths are applied under high pressure to insure dense surface. Lead tanks are kept under inert atmosphere to prevent formation of impurities. All constructions available, including type GN glass, neoprene fabric jackets.

TIGER BRAND ASBESTOS CABLE

On these cables, we do *not* apply the asbestos as a twisted yarn, because the yarn will frequently open when the cable is kinked. Tiger Brand cables feature asbestos that is combed and carded, then applied as a true felt which is compressed tightly around the conductor.

TIGER BRAND VARNISHED CAMBRIC CABLE

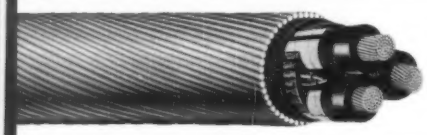
This is the great "in-between" insulation, for use where you want greater moisture resistance than paper has, and higher voltage ratings than offered by rubber insulations. In dry locations, varnished cambric can be used without a lead sheath, because it is not subject to oil drainage.

TIGER BRAND RR CABLE

Features rubber insulation and a neoprene sheath. A versatile cable—with heavy jackets—it can be buried directly in the earth. It is perfect for conduit wiring when supplied with a thin sheath. When several RR cables are combined with a bare messenger, you have a self-supporting aerial cable.

TIGER BRAND AMERCLAD

The very highest quality in *heavy-duty* portable cords and cables. All jackets are vulcanized in a lead sheath, and are permanently marked with molded identifications. High neoprene jackets show phenomenal resistance to abuse, sunlight, grease, oil or acid mine water.



TIGER BRAND SUBMARINE CABLE

Many Tiger Brand submarine cables are still in service after 30 or more years. Heavy galvanized steel armor wires are applied with long lay to resist tensile stress. AS&W pioneered in construction of aluminum armor for salt water use.

TIGER BRAND INTERLOCKED ARMOR CABLE

Available up to four-inch core diameter, with armor of steel or aluminum. Eliminates costly conduit bending and fitting. Splices can be made anywhere along the cable's length. A great money saver for plant wiring installations, especially in cramped quarters.

TIGER BRAND ELEVATOR CABLE

Cables are carefully designed to have just the right degree of flexibility so they will bend easily at the bottom of the shaft, but not so sharply that the wires will be deformed. We also supply a complete range of annunciator, lighting and signal cable, plus hatch wire for elevator shafts.

A Standard Tiger Brand Cable for every special job

AMERICAN STEEL & WIRE DIVISION • UNITED STATES STEEL

USS Tiger Brand Electrical Wire & Cable

Electroluminescence Soon Practical, Says Witting

Electroluminescence as a means of lighting rooms and office space may well be practical within the next few years. The announcement was made by Chris J. Witting, vice president and general manager of Consumer Products Divisions, Westinghouse Electric Corp, during a press interview in San Francisco. His company will demonstrate this new light source at the September opening of its Research Center in Pittsburgh.

The electroluminescent light source consists of a sandwich of a special phosphor powder between a metal film and a plate of electrically conductive glass. The sandwich emits light when subjected to an electric field.

Witting said the light output, as well as the color of the light, can be controlled in the new light source. First applications probably will be made in commercial establishments with the light source as part of the walls and ceilings.

In the appliance field, Witting sees a continued trend toward fewer and larger manufacturers. Retailers, he said, generally are choosing one manufacturer who offers a full line of appliance products. And this trend toward fewer manufacturers will also reduce the number of appliance dealers, he predicted.

"We have found that it costs virtually as much to service a small dealer as a large one, and we anticipate there will be fewer in the future. Westinghouse which once had 18,000 dealers, now has about 13,000. But 20% to 30% of them give us 80% of our sales volume."

To locate appliance prices on a firm foundation, which has been shaken by the selling of dumped stocks at distress prices, Westinghouse increased prices on major appliances 1% to 10% early in August, Witting said.

CP&L Seeks FPC License

Carolina Power & Light Co has applied for an FPC license for two existing developments on the Yadkin, Uwharrie, and Pee Dee Rivers in North Carolina, and for expansion of one of these developments, Tillery dam, by installation of an additional 22,000-kw generator at a cost of about $3.2 million.

"IT SAVES TIME AND MONEY"

• • • says Kansas City Power & Light Company regarding their Tel-E-Lect equipment

Takes only a two-man crew — one man in the cab and one man on the auger.

There's a lot of action when trucks mounted with Tel-E-Lect equipment go to work for the Kansas City Power & Light Co. of Kansas City, Mo. These pictures, taken at the site of the new Farmers Underwriters Assn. building in Overland Park, Kan., show the Power Company installing lines for 3 phase power. The holes being dug vary from 6½′ to 10′ deep. The company particularly likes the fact that the Tel-E-Lect digger unit is detachable from the truck, a big convenience feature.

What you see in operation here is Tel-E-Lect's Popular Model 350 digger that permits a two-man crew to dig a hole and set a pole in less than five minutes. Here you have low speed for digging, high speed for throwing off the dirt. For more information about the wide range of Tel-E-Lect equipment for utility trucks, write for a complete line bulletin.

There's a Tel-E-Lect service-dealer near you!

TEL-E-LECT

10003 Minnetonka Blvd.
Minneapolis 26, Minn.
PRODUCTS, INC.

"... we have rallied our forces"

"LIVE BETTER . . . *Electrically* has provided us with a battle cry behind which we have rallied our sales, advertising and promotion forces. With this concentration, we have been able to penetrate deeply into the public consciousness – with noticeable results at all levels of our industry here in San Diego. Our BIG PUSH on LIVE BETTER . . . *Electrically* will continue on an all-out basis."

E. W. MEISE, *Sales Manager*
San Diego Gas & Electric Company

San Diego Gas & Electric Company gets results push on LIVE BETTER...

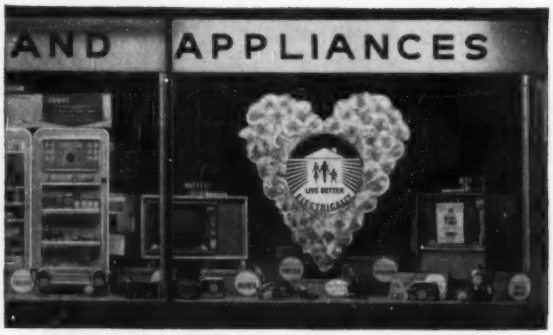
Immediately after the February 8, 1956, closed-circuit telecast which launched the LIVE BETTER . . . *Electrically* promotion, the San Diego Gas & Electric Company revamped its 1956 residential sales program to include the LIVE BETTER . . . *Electrically* theme in each individual campaign sponsored by the Company, the Bureau of Home Appliances and the Electrical Contractors Division of the Bureau.

This is an example of how one combination utility is making the most of LIVE BETTER . . . *Electrically* to build residential load. Today over 300 utilities throughout the country are actively participating in the powerful, industry-wide program.

BIG OCTOBER PUSH

The LIVE BETTER . . . *Electrically* program plans a concentrated, nationwide drive in October, aimed particularly at dealers and department stores. Major electrical manufacturers are encouraging their distributors and dealers to get ready now to spearhead this major push to retailers in their communities.

At cooking classes, LIVE BETTER . . . *Electrically* is an "umbrella" theme. Here, Home Economist Mrs. Thelma Walters demonstrates better living through the use of electricity.



Dealer displays are set up by utility dealer representatives. Manager of this store says the display tripled small-appliance sales during its 10-day run. Weeks later, sales were still 50% ahead!

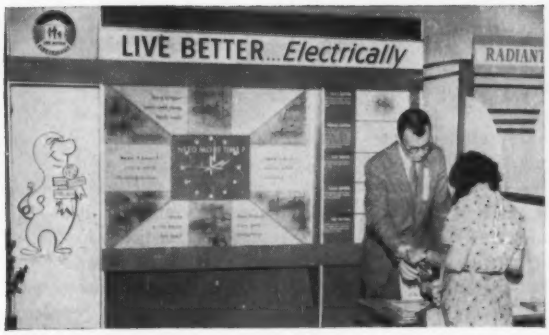
. . . . . .

with all-out *Electrically*

On television, Shirley Bradley and C. J. Bunce tell about electrical living. On radio, the theme is used on "Home on the Ranch." Both programs are sponsored by the San Diego Gas & Electric Company.

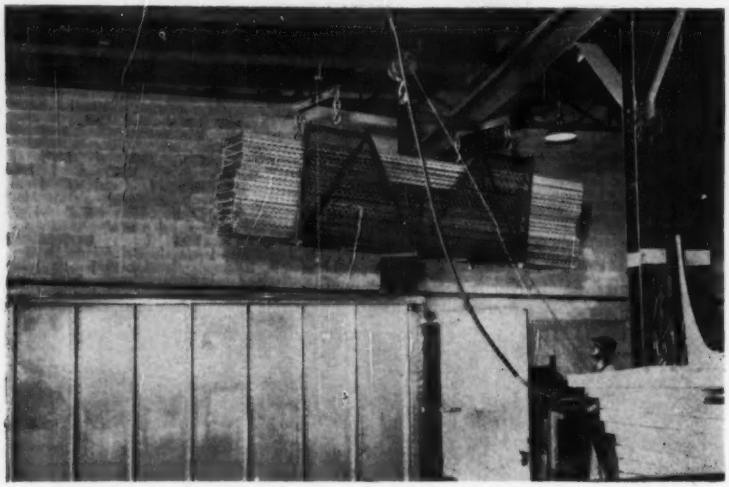
In newspapers, all San Diego Gas & Electric advertisements feature LIVE BETTER . . . *Electrically*. Here, manager Forrest Raymond checks a few of the advertisements incorporating the theme.

Outdoor posters blazon the LIVE BETTER . . . *Electrically* slogan, stimulating local action with local identification. This utility uses a 100% showing throughout San Diego and county.



At spring fairs and gift shows, the San Diego Gas & Electric Co. uses effective exhibits like this to present LIVE BETTER . . . *Electrically* to the public. Over 60,000 people attended the last show.

Spectacular illuminated displays promote LIVE BETTER . . . *Electrically* at the home offices. Here, Lisle B. Jones, head of Residential Electrical Sales Department, points out one of the displays.



Materials Handling Revamped at Cope

T. J. Cope, Inc, has revised its materials handling techniques. These changes were included in consolidation of operations at the Collegeville, Pa., plant (EW, Sept. 10, p 55). As a result, the company's production capacity has quadrupled.

These materials handling techniques are said to account for great increases in efficiency. When raw material, such as flat sheets of expanded metal, arrived by truck at the former Philadelphia plant, five or six men required half a day to unload it. Using the new cradle (shown above) designed by Cope's Works manager, two men can do the same job at the new plant in 20 minutes. This is typical of some of the new methods being used.

Olin Revere Formed to Produce Aluminum

Olin Revere Metals Corp has been formed by Olin Mathieson Chemical Corp and Revere Copper & Brass Inc. This jointly owned $231 million company was formed to produce 180,000 tons of primary aluminum per year. The announcement was made recently by Thomas S. Nichols, president of Olin Mathieson, and James Kennedy, chairman and chief executive officer of Revere.

Ownership of Olin Revere is on a 50-50 basis. President of the new corporation will be Walter F. O'Connell, who will continue as executive vice president in charge of Olin Mathieson's aluminum program.

The new corporation is being financed through a $100 million loan from a group of banks and the sale of $100 million in first mortgage bonds to a group of life insurance companies. Remaining $31 million will be provided by Olin Mathieson and Revere through equal purchases of the common stock and subordinated debentures of the new company.

Olin Mathieson has contracted with Olin Revere on a long term basis for 120,000 tons of primary aluminum a year—twice the amount the former corporation was to produce under its original program for entering the primary aluminum industry. Revere has made a similar contract with the new company for 60,000 tons a year.

Facilities of Olin Revere Metals Corp will include:

1. An alumina plant with a capacity of 350,000 tons per year. This plant will be built on a site to be selected near the Gulf Coast on deep water transportation.

2. A reduction plant with 180,000 tons per year capacity, which is now under construction at Olin Mathieson's original aluminum site near Clarington, Ohio. Previous Olin Mathieson plans called for a 60,000 ton reduction plant. Capacity production is expected to begin late in 1958 with some limited production expected before then.

3. A new power subsidiary wholly owned by Olin Revere, which will own two 225,000-kw generating units in a new power plant at Cresap, W. V. These units will supply power to the reduction plant. A third 225,000-kw unit at the power plant will be owned by Ohio Power Co, a subsidiary of American Gas & Electric Co. All three units will be operated by Ohio Power Co.

Olin Mathieson's original plans marked the first time in the history of the aluminum industry where coal mined directly on the site would provide the large power requirements for the reduction of alumina to pig aluminum (EW, Jan. 30, p 9). Coal will be mined directly on the site of the power plant at Cresap, West Va. (across the Ohio River from Clarington) by the Pittsburgh Consolidation Coal Co, Inc. Power from the generators at Cresap will be transmitted to the reduction plant.

GE Installs New 'Brain' in Calculations Center

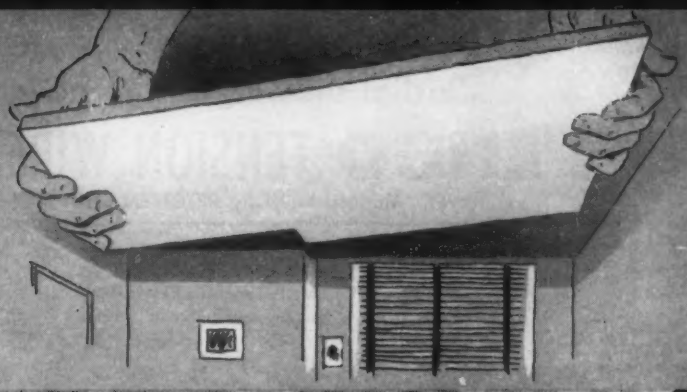
An Engineering Calculations Center has been established at Schenectady, N. Y., by General Electric Co, according to a recent announcement. Established as a development aid for steam turbine-generators, the center uses an International Business Machines Corp 704 model electronic computer.

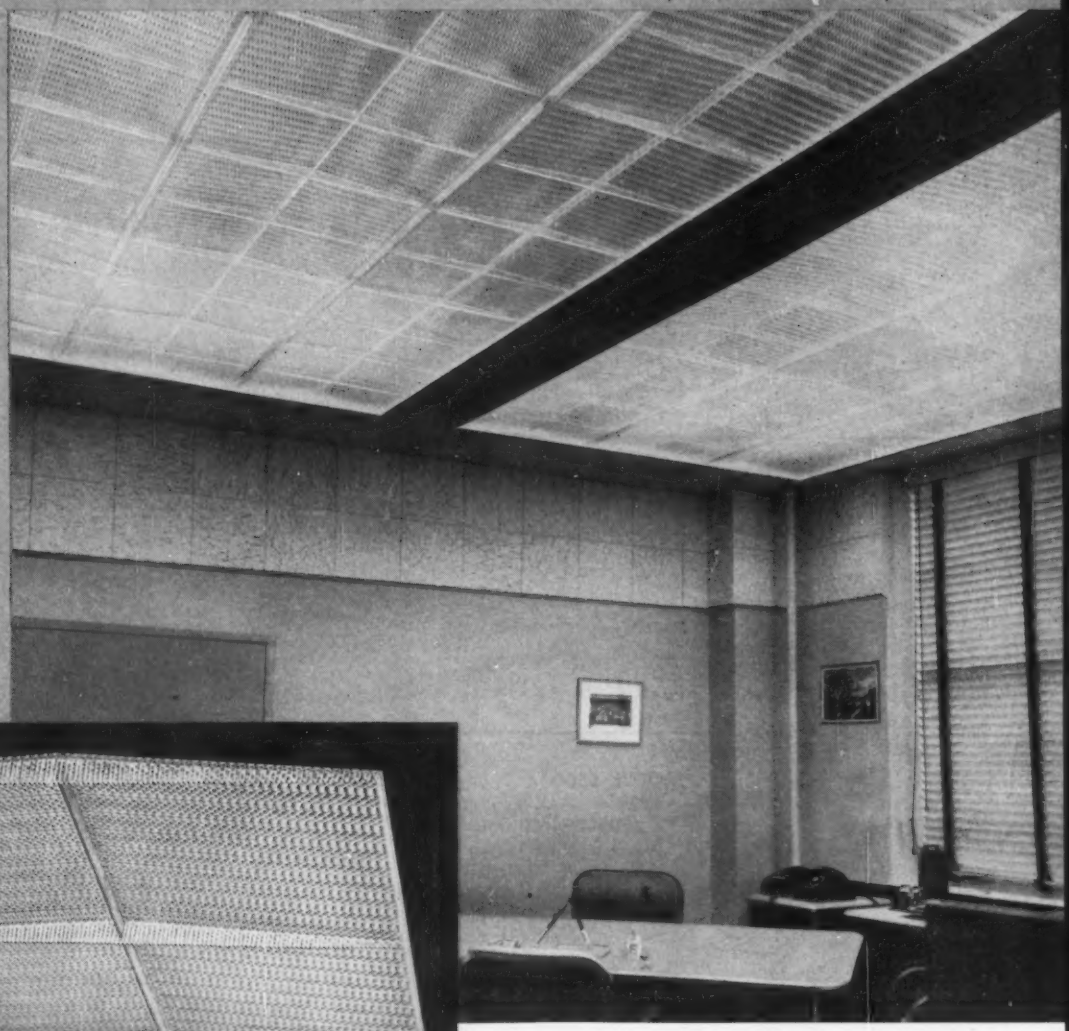
The "electronic brain" is solving advanced calculations on heat balances, combined critical speeds of turbine-generators, low-pressure turbine 3-D stage design systems, generator rotor heat transfer problems, bucket stimulus calculations and other

(*Continued on page 275*)

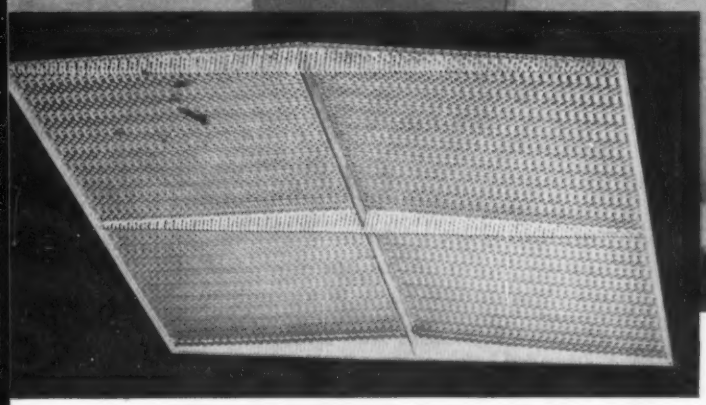
Holophane Engineers
lifted the top off this room

and inserted the "sky"
in the ceiling...





No. 6024
PRISMALUME*
CONTROLENS*
2-Foot Sq. (Approx.)



Whether for 2-foot-wide troffers of any length . . . or for large panels as shown above . . . the new HOLOPHANE No. 6024 PRISMALUME* is another tremendous step forward! . . . It produces maximum quantity of controlled light which provides complete visual comfort . . . Recommended for better fluorescent illumination of offices, showrooms, laboratories, stores, schools,—almost every form of modern installation...Write for detailed engineering data on this remarkable new Holophane development.

For Better Lighting Holophane *... Be Specific*

HOLOPHANE COMPANY, INC.

Lighting Authorities Since 1898

342 MADISON AVENUE, NEW YORK 17, N. Y.

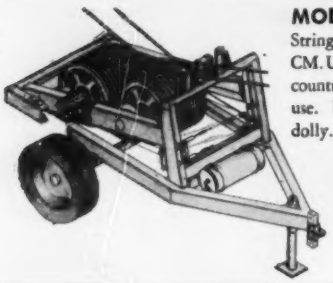
THE HOLOPHANE CO., LTD., THE QUEENSWAY, TORONTO 14, ONT.

Trademark

Partial showing of the now ***COMPLETE*** line of...

PENGO TENSION WIRE STRINGING EQUIPMENT

Manufactured By **PETERSEN ENGINEERING CO., *Santa Clara, Calif.***

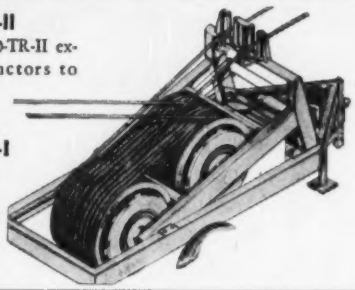


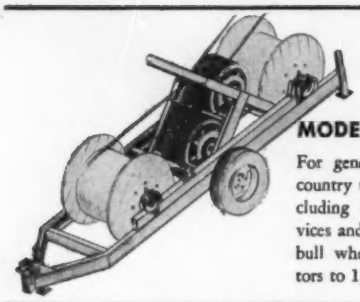
MODEL 5000-TR-II
Strings two conductors to 556,300 CM. Used primarily for very rough country work; also for general use. Use separate reel-carrying dolly.

MODEL 5000-TR-I
Similar except strings one conductor.

MODEL 6000-TR-II
Similar to Model 5000-TR-II except larger. Conductors to 1,272,000 CM.

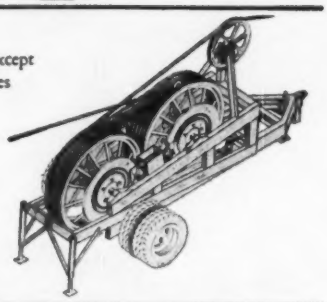
MODEL 6000-TR-I
Similar except for one conductor.

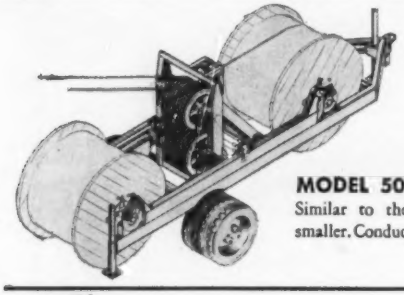




MODEL 6000-WS-TR
For general and medium rough country use. A complete unit including trailer, reel-carrying devices and its own double pair of bull wheels. Conductors to 1,272,000 CM.

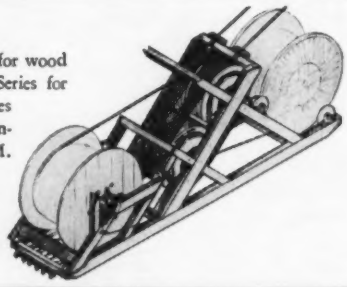
MODEL 7000-TR-I
Similar to model 6000-TR-I except larger. Conductors to 2 inches diameter.

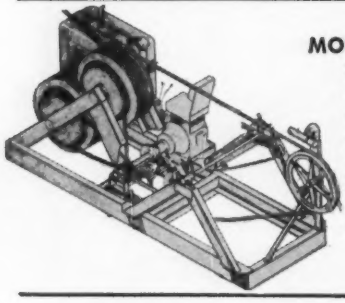




MODEL 5000-WS-TR
Similar to the 6000-WS-TR but smaller. Conductors to 556,300 CM.

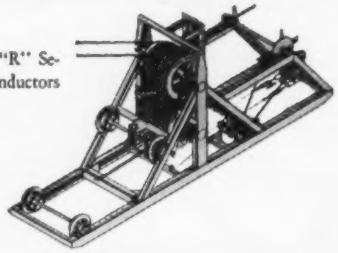
MODEL 6000-W
Available in "S" Series for wood or steel reels, in "R" Series for steel reels, or "SR" Series for trailer mounting. Conductors to 1,272,000 CM.

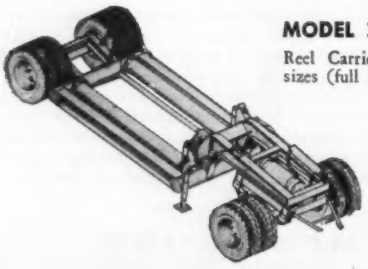




MODEL 6500
Bull Wheel Cable Puller. Available in "R" Series for steel reels, "S" Series for wood reels. Conductors to 1,272,000 CM. Also available in "LWR" Model for extra-large steel reels. Model 5500 similar (smaller).

MODEL 5000-SR
Available in "S" Series, "R" Series, or "SR" Series. Conductors to 556,300 CM.





MODEL 7500
Reel Carrier. Takes the largest sizes (full range) of steel reels. Loads and unloads with one man. No auxiliary equipment needed except the truck that pulls it. For use with any one of the tensioning machines shown on this page.

ADDITIONAL MODELS NOT SHOWN

Tension Reel Trailers

MODELS 2, 3, and 4, Two-Wheel Straddle Dollies not shown. For use with any one of the tensioning machines shown on these pages.

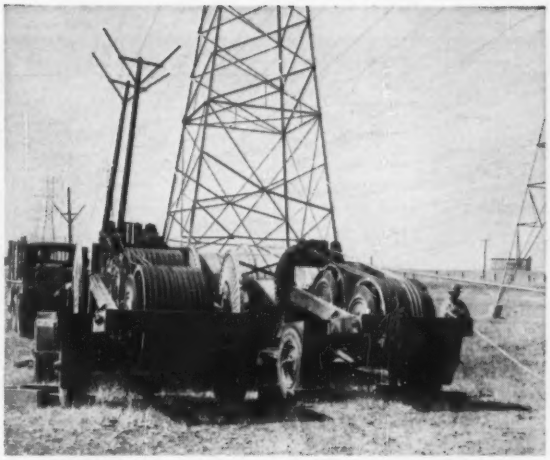
Tension Stringers

MODELS 6000-SK-I and 6000-SK-II For one or two conductors to 1,272,000 CM. Skid mounted for installation on owner's equipment.

MODELS 5000-SK-I and 5000-SK-II Skid mounted for installing on owner's equipment. For stringing one or two conductors to 556,300 CM.

MODEL 5000-WS-III Strings three conductors to 556,300 CM. For mounting on low-bed or full trailer.

MODEL 6000-WS-III Strings three conductors to 1,272,000 CM. For mounting on low-bed or full trailer.



Two PENGO model 6000 TR-II wire tensioners being used by Pacific Gas and Electric Co. in reconductoring job between Vacaville, Calif. and Cottonwood, Calif. 285 miles of 500 MCM copper is being replaced by 954 MCM aluminum in this operation.

Newest method of stringing overhead lines

Two PENGO model 6500 Bullwheel Cable Pullers used by Pacific Gas and Electric Co. for pulling in the new line on the job mentioned above. Unit, manned by an operator and one reel tender, pulls the pulling line (in this instance the old copper conductor) over the double neoprene lined Bullwheels and winds it for shipment in a single operation.

- ***Safest, most economical way of stringing transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits . . . by far the safest, too!***

Smooth, postive control of conductor tension can be maintained at all times regardless of model or size of PENGO tensioning equipment used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

Note the wide range of models on the opposite page available for all types of jobs or terrain and for all sizes of conductor.

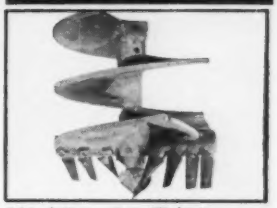
List your requirements and send for descriptive literature and prices.

Made by the makers of the World-Famous
PENGO EARTH AUGERS

PETERSEN
ENGINEERING COMPANY
Santa Clara, Calif.

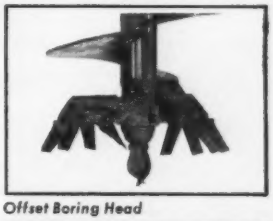
PETERSEN ENGINEERING CO.
Santa Clara, California Dept. 4
Please send me more information on the new Pengo wire stringing equipment.
Name_____
Firm_____
Address_____
City_____ State_____

Other PENGO Products include:

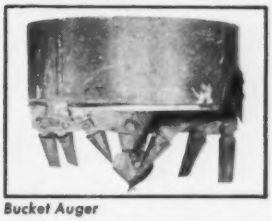


24 inch Heavy Duty Flight Auger

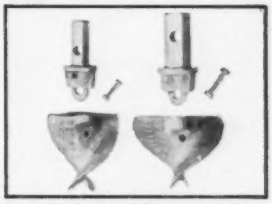
Double-Helix Heavy Duty Auger



Offset Boring Head

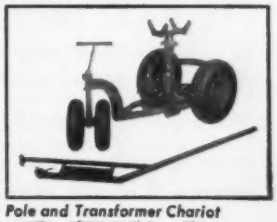


Bucket Auger

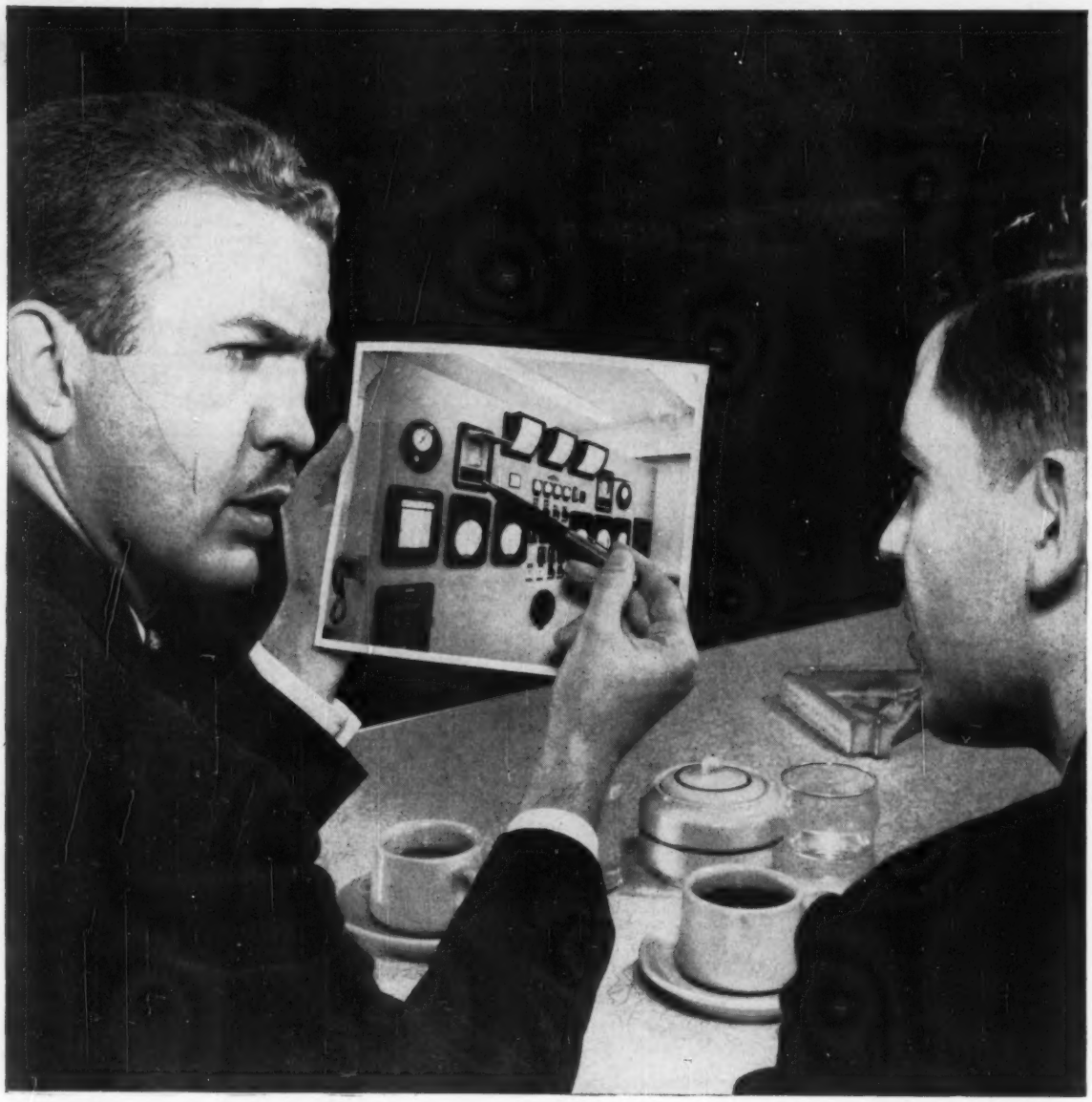


Screw Bit for Small Diameter Holes

Pulling Eye



Pole and Transformer Chariot



"What, a TV camera looking into the boiler?"

"That's right, Paul. Television cameras are constantly observing the flame conditions in the furnace and the water level in the drum of the power plant boiler."

"Where does the 'picture' come out?"

"At two television receivers on the boiler control panel located in the central control room."

"Where was this again?"

"Down at Southwestern. Southwestern Public Service Company at Denver City, Texas."

"How big is the unit?"

"52,500. They showed me all around: through the 115 KV substation, the power plan building housing the turbo generator and outdoor boiler installation. Real neat job."

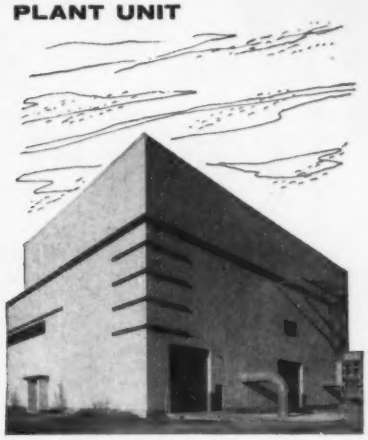
"Who built the plant?"

"A good outfit—Pritchard!"

J. F. PRITCHARD & CO.
4625 Roanoke Parkway, Kansas City 12, Mo.

"What, a TV camera looking into the boiler?"

TEAMWORK BUILT THIS SOUTHWESTERN PLANT UNIT



Teamwork between Pritchard and Southwestern staffs built their new Denver City, Texas power plant unit. Pritchard's ability to work closely with client personnel was the key to successful completion of this power plant project.

Pritchard can do the same job for you!

Why don't you contact Pritchard *first* . . . the next time you make plans to construct, modernize, or expand your power plant.

LIKE TO SEE THE PICTURES?

We'll be glad to send you photographs of this plant unit. They will give you a quick, illustrated tour through the Southwestern installation. Just send your name and address on your company letterhead and we'll send them to you!

INDUSTRY'S PARTNER FOR PROGRESS

J.F. Pritchard & Co.
ENGINEERS • CONSTRUCTORS
Dept 511, 4625 Roanoke Parkway
Kansas City 12, Mo.

SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES
BOSTON, CHICAGO, BUFFALO, HOUSTON, NEW YORK, PITTSBURGH

(*Continued from page* 270)

correlated types of work, GE said.

The machine does as much calculating in one minute as a person with a hand calculator can do in 50 hours. It is housed in about half the center's 9,000 sq ft of space in GE's Schenecetady Works.

Main Kuhlman Offices to be Built at Detroit

Kuhlman Electric Co broke ground this month for a new administration building. The headquarters will be located in the Detroit metropolitan area. The company manufactures utility and industrial transformers.

Kuhlman opened its first plant at Elkhart, Ind., in 1894. Their first expansion was in 1915, when the company moved to its present location in Bay City, Mich. Later, in 1938, Detroit Electric Furnace Division was added to its Bay City operations. Recognizing the growth of the South and the West, Kuhlman located a factory at Crystal Springs, Miss., in 1952, and another at Calinas, Calif., in 1954.

A-C Inaugurates Program To Train Hi-School Grads

To meet growing demands for technical employees, Allis-Chalmers Mfg Co has launched a three-month, company-wide training program for high school graduates. The course-takers are expected to lessen routine tasks which take some of the time of fully-trained engineers, an Allis-Chalmers' spokesman said.

The grads, selected on the basis of technical aptitudes for the first class, will study phases of company operation along with basic engineering subjects like mathematics, blueprint reading, curve plotting and shop sketching. They'll also explore drafting and engineering standards, cost analysis, human relations, basic electricity, office machines, communications and business English.

Lectures and required reading will be augmented by movies, slides, models, exhibits and experiments. After completing the course, the men will be assigned for final training and job selection in departments using technical personnel.

The program is under the direction of F. W. Churchill, drafting training supervisor for A-C's Power Equipment Division.

PLANT EXPANSIONS

• Acquisition of a bituminous fiber pipe manufacturing plant will up production of electrical conduit, and sewer, drainage and irrigation pipe by 10% for Brown Co, New England pulp and paper producer. The Corvallis, Ore., plant was purchased from Blacfiber Pipe Co.

• Laboratories designed for basic research in chemical and solid state physics will be dedicated by National Carbon Co September 18 in Parma, Ohio. The 175,000-sq ft addition brings to seven the number of major research centers operated by divisions of Union Carbide & Carbon Corp.

• Production capacity of solenoid valves and electromagnetic controls will be doubled at the end of 1956 with completion of new Automatic Switch Co plant. The Florham Park, N. J., building will have 120,000 sq ft of floor space on 30-acres.

• Modernization of manufacturing and distribution facilities will aid in handling an increased volume of fluorescent and incandescent lamp business for Duro-Test Corp, North Bergen, N. J. A new 64,000-sq ft shipping center and a 50,000-sq ft addition to its main plant will bring the firm's space to a total of 331,000 sq ft. Completion dates are September 1956, and January 1957, respectively.

• Johns-Manville Corp will start construction of its seventh Transite pipe plant. It will be located at Denison, Texas. Ground was broken recently for a plant at Stockton, Calif. Additional pipe production facilities have been or are being added to four other plants. A. R. Fisher, president, said that these new plants and facilities are included in an approximate $40 million Transite pipe expansion program initiated this year.

• Increased market for glass-reinforced plastic electrical insulating materials has occasioned start of a 50% plant addition for Glastic Corp. It is the third major expansion for the Cleveland, Ohio, firm in its 10-year history.

"When you're as old as me, sonny,
this meter will still be working!"

Tom Barnes, Mgr. Meter Engineering, Says:
"WE ARE CERTAIN THAT LOAD GROWTH WILL NEVER MAKE THIS METER OBSOLETE."

The New Westinghouse 30-Ampere Meter

Good news! For only pennies a year over the cost of ordinary meters, you can buy the new 30-ampere Westinghouse Lifetime Meter. It's good insurance against load-growth problems. This new meter will handle all single-phase loads up to 200 amperes.

Few homes *today* require 200-ampere meters. But how about the future? Industry forecasts predict a tremendous growth in the use of electric power, particularly in the home.

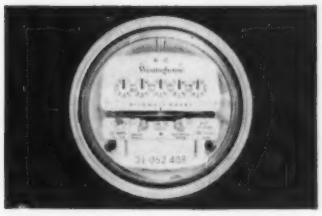
The 30-ampere meter gives you a substantial cushion against this future load growth. It is your guarantee that whatever the future, your meters will have the capacity to handle the load.

In most localities, testing requirements are the same as for 15-ampere meters. For only a little more, you get twice the metering capacity when you specify 30-ampere Lifetime Meters.

For more information, see your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

J-40489

New 30-ampere meter gives you all the Lifetime features



10,000-volt impulse insulation level in current and potential coils. De-ion® gap discharges outside the meter at 6500-volt impulse for lightning protection. Corrosion resistance in all components. Full and light-load adjusters are linear, 20% range, accessible from the front.

Alnico damping magnets for extreme stability. Famous Westinghouse ball-and-jewel bearing, a proved Lifetime bearing.

WATCH WESTINGHOUSE

*WHERE THE **FUTURE** IS **ALREADY** IN PRODUCTION!*

Here's the PITCH
for faster, more economical anchoring

CHANCE BLACKFOOT ANCHORS

Can be installed by machine to cut line construction costs

Here's a screw anchor that goes down fast and easy whether your line crews install it by hand or by machine. A king-size thimbleye on the Chance Blackfoot will accommodate a big turning bar for easy hand installation. And when you machine-install a Chance Blackfoot Anchor, you reduce installation time to a minimum—which means a big savings in time and money!

What about holding power? Dynamometer tests on a Chance 15 inch Blackfoot Screw Anchor showed no creep at 22,000 pounds!

SMALLER HUB

Smaller hubs on Chance Screw Anchors mean less friction—easier installation. Less earth is disturbed during installation. That's why the Blackfoot has greater holding power.

PITCH CONTROLLED

This accurately pitched, fast cutting blade really goes down fast. Every size anchor is individually "pitch controlled."

Man! that anchor comes down fast!

"ANCHORING" is the most complete guide to anchoring and guying ever developed. It shows how to choose the right anchor for every job—and how to install it *right*. Send for your copy!

CA56-8A

A·B·CHANCE CO·
CENTRALIA, MISSOURI

M&M BRIEFS

Westinghouse Electric Corp recently dedicated an IBM-705 computer at its Sharon (Pa.) plant. The 705 will be used for complex design work on large transformers and business data processing. A similar electronic "brain," the IBM-704, will soon be installed at the firm's East Pittsburgh plant for calculating power problems of atomic reactors, determining stresses in generator shafts, and designing turbine generators. The 704 will solve comparable problems for Sharon, Baltimore and Kansas City plants by remote control.

Flexicore Co, Inc, of Dayton, Ohio, and **Conduflor Corp,** Buffalo, N. Y., received an Underwriters Laboratories' rating this month for their precast structural concrete floor system with underfloor electrical distribution for office buildings. The system uses hollow cells in Flexicore precast concrete floors as raceways and provides floor outlet spacing as close as 5½ in., the firms state. No fireproofing is required, they say, and design permits clear spans of 20 ft without intermediate beam use.

Perkin Engineering Corp, El Segundo, Calif., has purchased a new building at 337 Kansas St, next to their present location. Increased production will include dc power supplies and ac line voltage regulators.

Gulton Industries, Inc, is the new name stemming from merger of Thermistor Corp of America and Vibro-Ceramics Corp with Gulton Mfg Corp. Gulton's offices and plant are in Metuchen, N. J.

Panellit, Inc, Skokie, Ill., maker of control and data reduction systems, has formed a subsidiary, Panellit Service Corp, to expand activities in instrumentation and automation field.

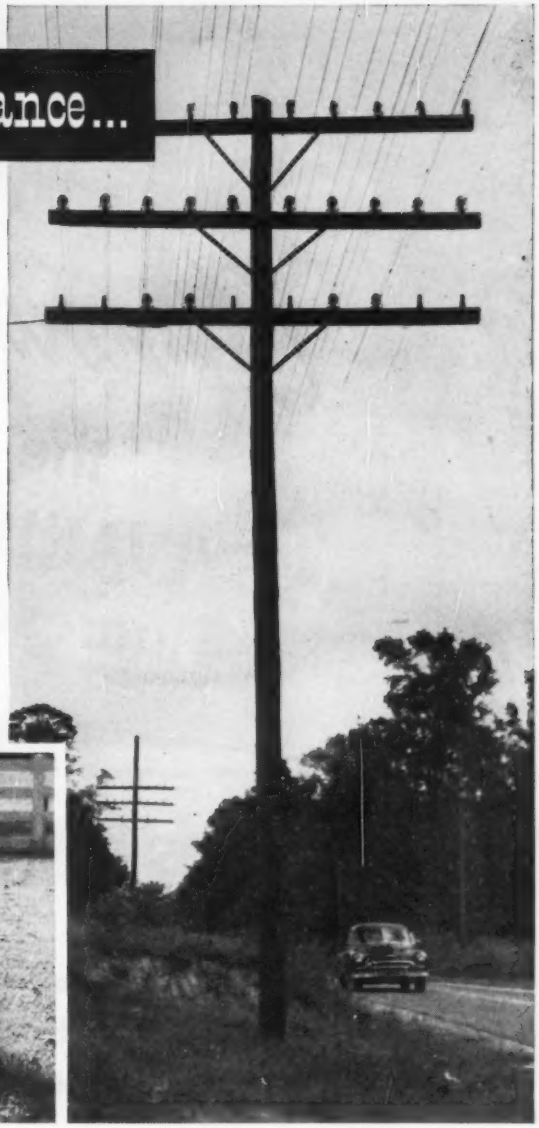
General Electric Co's Apparatus sales representatives have available to utilities seven animated color displays of a steam turbine cutaway. The exhibit, U-129, is 8 x 8 ft with 3-ft depth, weighs 750 lb.

Burndy Engineering Co, Inc, will show products of its new Omaton Division in a 2-yr tour of U.S. by a mobile display unit. Division makes connectors for electric, electronic markets.

Here's Proof of Performance...

Pressure-creosoted poles stand up better

reports North Carolina Utility



The Carolina Telephone & Telegraph Company, serving 100,000 customers, is the largest telephone utility in North Carolina, and has been using pressure-creosoted pine poles since 1925. At the present time they have more than 154,000 poles in use on more than 4,500 miles of line. They are adding to this number at the rate of about 10,000 poles per year and within a short time the few remaining untreated poles will be replaced with pressure-creosoted poles. All of the pressure-creosoted poles in use here were supplied by a treater who uses USS CREOSOTE.

The operating officials of the Carolina Telephone & Telegraph Company say that pressure-creosoted poles enable them to offer their customers more efficient service. Their pressure-creosoted poles not only withstand the attack of termites, rot, fungi, and adverse soil conditions, but they also stand up well under adverse weather conditions like the hurricanes that have hit their area in recent years. These same officials add that they are convinced that pressure-creosoted poles are a worthwhile protection for their valuable investment in service and equipment.

For more information on pressure-creosoted utility poles, send for the free USS booklet, "A Report on Pole No. 92159." Just write to the nearest District Sales Office of United States Steel or directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

The poles in this line of the Carolina Telephone & Telegraph Company, located near Pinetops, N. C., have been in service for 25 years, and the company believes they are good for several more years. Although the overhead line load has doubled in the last decade, these older pressure-creosoted poles are still strong enough to handle the increased load.

You can obtain clean pressure-creosoted poles upon specification without sacrificing pole service life.

USS CREOSOTE

6-624

SALES OFFICES IN PITTSBURGH, NEW YORK, CHICAGO, CLEVELAND, SALT LAKE CITY AND FAIRFIELD, ALA.

USS

UNITED STATES STEEL

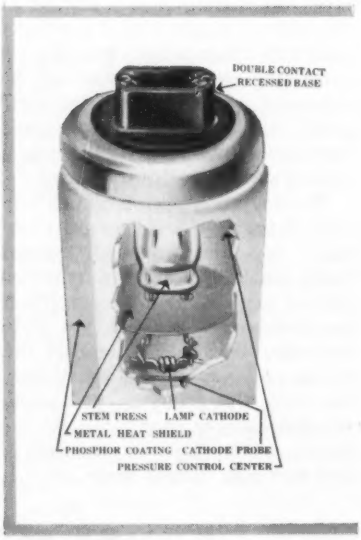
Produces more than twice the light

In appearance, the VHO-25 is a standard 4-foot T-12 lamp, yet it produces more than double the light output of 40-watt fluorescent lamps made until now

Due to the substantially greater light output of the Sylvania VHO, High-Bay Industrial fluorescent lighting becomes practical and economical. In Low Bay lighting, VHO lamps will, in many cases, prove more economical because fewer fixtures are required.

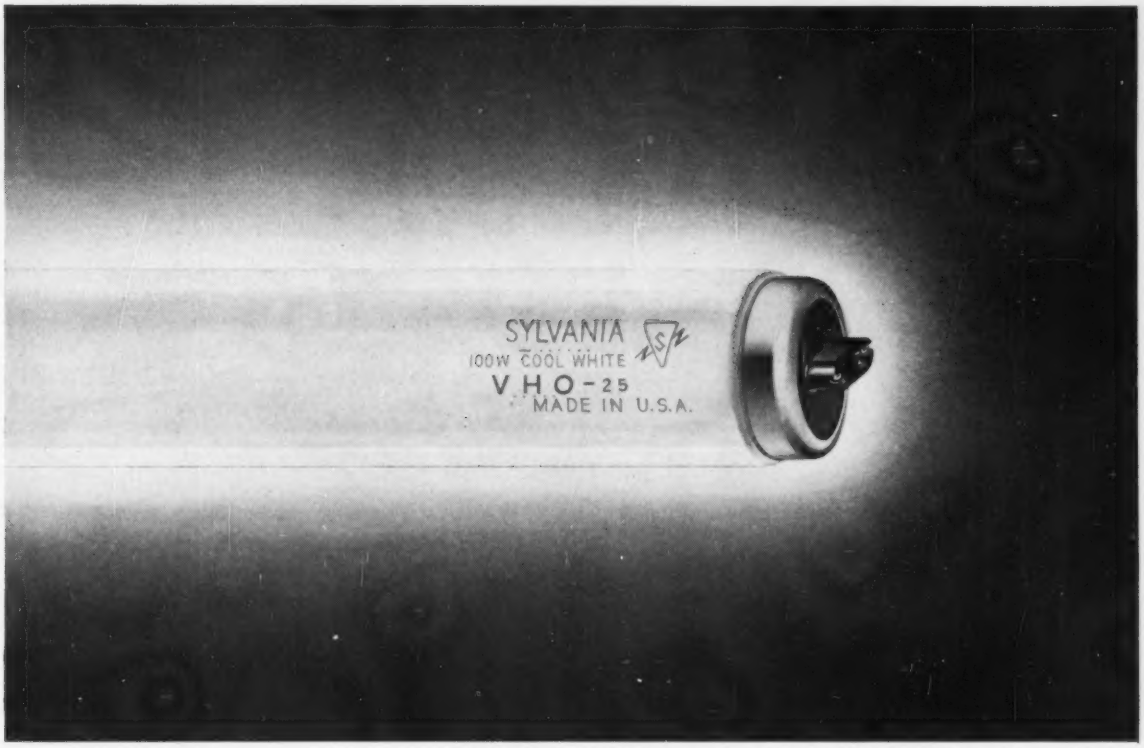
VHO lamps are also a new and practical answer to better, highly efficient street lighting . . . use a minimum of lighting units of less cumbersome size. They are also particularly suitable for other outdoor lighting applications such as store fronts, service stations, and floodlighting of outdoor industrial or commercial areas.

If you are considering plans which include lighting for new construction or modernization, the new Sylvania VHO fluorescent lamp will be of particular interest to you. For complete details consult your local Sylvania Representative, or send today for your free folder about the revolutionary Sylvania VHO Rapid Start Fluorescent Lamp. Mail your coupon now.



SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, 60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric Products (Canada) Ltd.
Shell Tower Building, Montreal

SYLVANIA



Sylvania's new VHO lamp makes possible more light per foot from fluorescent lamps

output of conventional 40 watt lamps!

Sylvania Research conquers Heat and Pressure—two major obstacles to more light per foot!

The VHO lamp represents an entirely new concept in lamp design—an entirely new way to get more light per foot from fluorescent lamps.

To make this achievement possible Sylvania engineers have developed and combined these vital features:

1. New "Pressure Control" Center. The specially developed, exclusive internal end construction of the VHO lamp creates "cool spots" at each end which allow mercury to condense.

2. Neon gas replaces Argon. Sylvania discovered that Neon actually gives far greater efficiency at higher wattages than the conventional Argon.

3. Use of standard T-12 bulb. The popular T-12 bulb permits maximum effective production and use of ultraviolet radiation within the tube.

4. The Patented Sylvania Rapid Start System. This fluorescent lamp development keeps filaments warm during operation, encourages effective electronic emission from filaments at all times.

MAIL your coupon TODAY!

Sylvania Electric Products Inc.
Lighting Division, Dept. EW, Salem, Mass.
Gentlemen: Please send me a Free copy of your new Sylvania VHO Fluorescent Lamp folder.

Name_____
Company Name_____
Address_____ Zone____ State____
City_____

... fastest growing name in sight

NEWS ABOUT PEOPLE

Holik Advances to El Paso Electric Presidency

William V. Holik, executive vice president of El Paso Electric Co, has been elected president and director of the Texas utility. He assumes the post left vacant by the recent death of F. Carter Womack, who served as president of the company for nine years.

The new El Paso Electric president first became associated with the utility in 1920 following his graduation from the Agricultural and Mechanical College of Texas with a degree in electrical engineering.

In 1922 Holik joined Stone & Webster Engineering Corp and the next year became associated with Blackstone Valley Gas & Electric Co. He remained with the Rhode Island company until 1926, when he joined Gulf States Utilities Co. Later, from 1935 to 1942, he was affiliated with Virginia Electric & Power Co.

Holik rejoined the El Paso utility in 1942 and since then has served as general superintendent and vice president. He was promoted to executive vice president last June 28.

WILLIAM V. HOLIK

Hatfield Assumes Sales Post

Combustion Engineering, Inc, has appointed Robert M. Hatfield as general sales manager of the company in addition to the duties he has assumed since 1952 as vice president.

Hatfield, former vice president of the Western Division, has been with the firm for 22 years, aside from two assignments with the government in Washington. During World War II he served on the War Production Board where he advanced to deputy vice chairman of production for all war industries. During the Korean War he organized and headed the National Production Authority's Power Equipment Division and later became vice chairman of the Munitions Board. An engineering graduate of Purdue University, Hatfield was assistant general sales manager and general manager of the Western Division before his election as vice president.

ROBERT M. HATFIELD

Hubbard Promotes Waggoner

Hubbard & Co has announced the promotion of Raymond M. Waggoner, vice president in charge of Pacific Coast sales, to vice president and general manager of Pacific Coast operations. His newly expanded responsibilities will include the management of the company's plant at Oakland, Calif.

Waggoner became affiliated with Hubbard in 1922 in the sales department of its Electrical Materials Division, with headquarters in Pittsburgh. His appointment as assistant sales manager of the Northeastern Division in 1928 was followed eight years later by his advancement to sales manager for the Midwest Division.

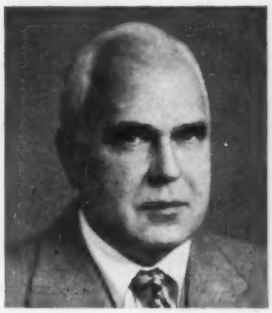
In 1948 he returned to the Pittsburgh office as vice president in charge of sales. He was elected vice president of Pacific Coast sales in 1952.

RAYMOND M. WAGGONER

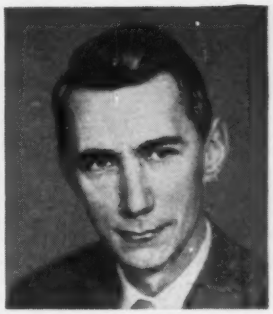
(*More News About People on page* 286)

WARREN A. MARRISON. Tompion Gold Medal, Worshipful Company of Clockmakers of the City of London, for pioneer work on development of quartz crystal oscillators as precision standards of time.

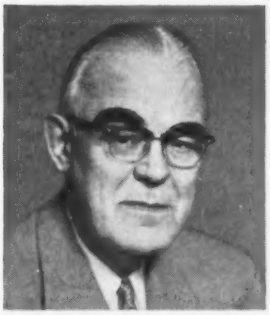
W. G. PFANN. Mathewson Gold Medal, American Institute of Mining and Metallurgical Engineers, for discovery of and pioneering research in zone melting.



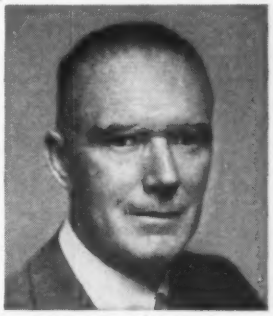
H. T. FRIIS. Medal of Honor, Institute of Radio Engineers and Valdemar Poulsen Gold Medal, Danish Academy of Technical Sciences; important work in application of short and ultra-short radio waves.



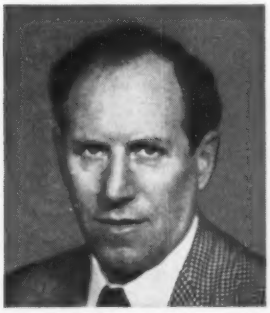
CLAUDE E. SHANNON. Stuart Ballantine Medal, Franklin Institute of the State of Pennsylvania, for contributions to a comprehensive theory of communication.



AXEL G. JENSEN. David Sarnoff Gold Medal, Society of Motion Picture and Television Engineers, for technical contributions to television; G.A. Hagemann Gold Medal for Industrial Research, Royal Technical College, Copenhagen.



H. F. DODGE. Shewhart Medal, American Society for Quality Control, for original contributions to the art of statistical quality control.



R. KOMPFNER. Duddell Medal, Physical Society of England, for his original work on the traveling wave tube.

WALTER H. BRATTAIN. Co-winner with Dr. John Bardeen of John Scott Medals, City of Philadelphia, for invention of the transistor.

PIONEERS OF PROGRESS

These are some of our recent medal winners at Bell Laboratories. The awards they have won symbolize recognition for outstanding achievement in the many sciences that bear on telephony. Bell Labs is extremely proud of them—and of the thousands of scientists and engineers who work with them to keep the American telephone system the greatest in the world.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

All the features you asked for make

1956

RM* Medium Transformers

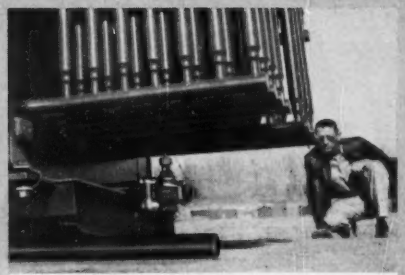
Your Best Buy

For further information on G-E Medium Transformers, contact your nearest G-E Apparatus Sales Office, or write Section 416-6, General Electric Company, Schenectady 5, N. Y.

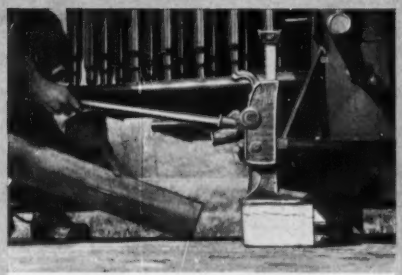
*Repetitive Manufacture

Progress Is Our Most Important Product

GENERAL ELECTRIC

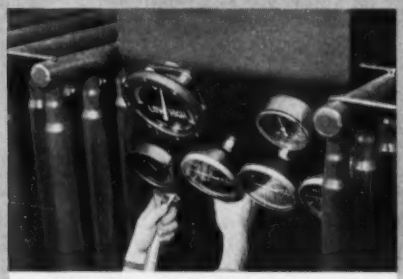


SLED-RUNNER BASE on all G-E RM transformers slides easily or rides smoothly over rollers, makes installation simpler. Wide face on I-beam will not cut rollers.

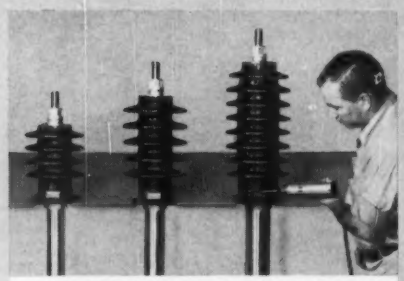


LIBERAL JACKING SPACE cuts installation time and effort. Minimum of 5½ inches between jackpad and ground provides more-than-adequate clearance for most jacks.

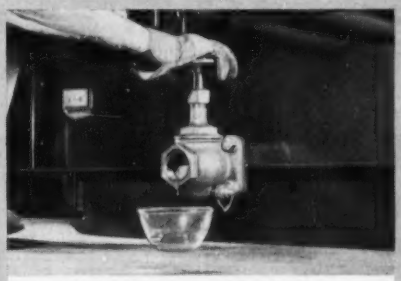
CONTROL CENTER groups all instruments and nameplate in one easy-to-see area; improves visibility, makes readings extra simple. Chances of error are reduced.



PROTECTED ACCESSORIES are recessed behind cooling tubes, sheltered against damage from blows that might be encountered during shipping and installation.

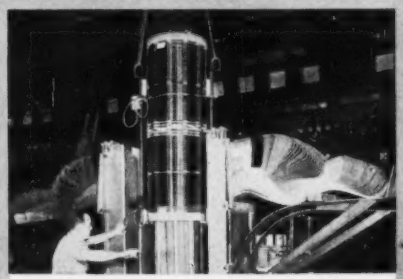


AMERICAN STANDARD BUSHINGS, used on all General Electric Repetitive Manufacture Medium Transformers, enable you to reduce your bushing inventories.



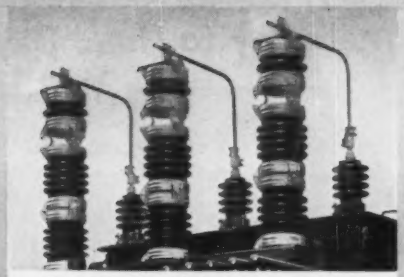
FULL DRAIN permits complete filtration, removes worst bottom oil. Sampling is more accurate, since sample is drawn from region of greatest contamination.

FORMEX* insulation is extremely rugged, has phenomenally high dielectric strength. Permits more compact, lighter RM transformers. *Reg. Trade-mark G.E. Co.

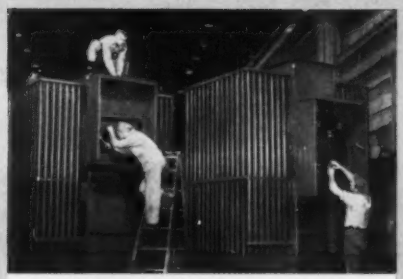


PRE-FORMED CORE, used in single-phase RM medium transformers, reduces core losses since magnetic flux path follows grain in core laminations, even at corners.

VENTILATED BASE permits free air circulation, helps prevent moisture from condensing under transformer, minimizes rusting and corrosion in this hard-to-reach area.



PRE-FITTED CONNECTORS between bushings and G-E Magne-valve lightning arresters simplify field installation, give better lightning protection.



REVERSIBLE JUNCTION BOX readily adapts to overhead or underground system, simplifies ordering and interchangeability, provides additional flexibility.

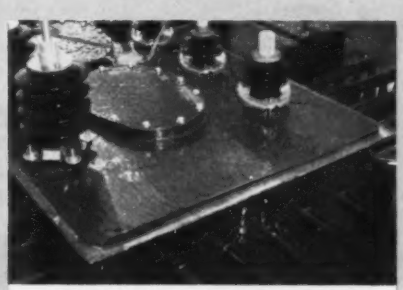
ONE CONTROL CONDUIT simplifies field wiring of accessories and controls. Connections for entire transformer are made to a single terminal board, shown above.

TILTED INDICATORS. Where control center group is sufficiently high above ground, indicators are tilted at proper angle to make instrument reading easier, more accurate.

CONDUITS AND FITTINGS for all control wiring are weather-tight, can be field assembled in minutes without cutting threads. Cover plate gasket is re-usable Nitrile.

NITRILE GASKETS resist weathering, seal without adhesives; no chipping required for removal. Re-usable again and again, they permit reduction of gasket inventories.

SUPER MELAGLYP FINISH saves up to two repaintings, is longer lasting in corrosive atmospheres. Metal is specially prepared for better adhesion, more uniform coating.



DOMED COVERS let water run off, help prevent dirt and rust from accumulating. Flanges around openings prevent foreign matter or moisture from rolling into tank.

SPRAY-ON PAINT, provided with every RM transformer, permits touching up of spots chipped or scraped during shipment or installation, before rust gets foothold.

WEDGE-TYPE TAP CHANGERS have rugged self-aligning contacts with wedging action to assure line contact. They can carry transformer's full-rated short-circuit current.

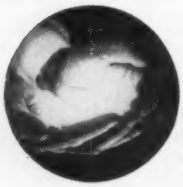
LARGER MANHOLES, introduced this year, mean easier accessibility to interior; allow easier and more accurate inspections. Even a husky man has plenty of room.

GENERAL ELECTRIC

Ask these questions, too, when you judge a fluorescent lamp...

Is your investment protected?

Check Westinghouse Fluorescent Lamps against any other brands you are now using. Check them for maintained brightness, long life, uniform appearance. If you are not entirely satisfied on all counts, your full purchase price will be refunded.



Is it built for good "lumen maintenance"?

Made exclusively with deterioration-resistant Halo Phosphors, Westinghouse fluorescent lamps *maintain* high light output to the end of their long lives.

Is it the correct type, size and color for the lighting job to be done?

In the Westinghouse fluorescent family of 290 different lamps—including Slimline and Rapid Start—there's a type and size precisely right for every office, plant and merchandising application. Colors include seven different shades of "white" alone.

For the full story on how to get more for your money in fluorescent light, contact your Westinghouse Lamp Representative.

WATCH WESTINGHOUSE

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Mahoney to Head Day-Brite Subsidiary

JAMES F. MAHONEY

James F. Mahoney has been elected to the post of president and general manager of Day-Brite Lighting, Inc, of California, wholly owned subsidiary of Day-Brite Lighting, Inc.

Before joining Day-Brite in this capacity, Mahoney for the past year has been president of his own management consulting firm in Los Angeles. He previously served as executive vice president of Gladding McBean & Co.

PERSONAL BRIEFS

Recently elected officers of Wyodak Resources Development Corp, a wholly-owned subsidiary of Black Hills Power & Light Co, are: **J. B. French** president, **Neil G. Simpson** vice president, **Harold E. Ross** vice president and general manager, **H. R. McIntosh** secretary and treasurer, **L. Duane Walrafen** assistant secretary, and **Harold E. Norman** assistant treasurer.

Chester B. Eaton, formerly vice president of Central Vermont Public Service Co, has resigned to become a field underwriter of Mutual Life Insurance Co in Rutland.

Recently promoted to superintendent of transmission construction for Indiana & Michigan Electric Co is **Harry T. Molden . . . M. C. Boogher,** vice president of Missouri Public Service Co has been elected a director.

Wisconsin Power and Light Co has promoted **Arnold A. Fick** district manager of Fond Du Lac succeeding **Fred Whitely,** retired.

Lewis P. Favorite, an executive of Aluminum Co of America, is new director of the Aluminum-Magnesium Division, Business and Defense Services Administration, U. S. Department of Commerce.

Dayton Power & Light Co has designated **Donald Cotterhill** supervisor of transportation department, succeeding **Fred Lewis,** retired after 45 years of service . . . New assistant supervisors of electric meter department and electric underground department are **Henry Duckworth** and **Robert Hipp** respectively; new supervisor of the revenue accounting division is **Thomas Eickmeyer. Carl Mirre** is taking Eickmeyer's former post as assistant credit manager. DP&L's other recent appointments include **John L. Walker** as supervisor of customer accounting department succeeding **Veryl Kinzig** who will devote full attention to accounting duties in the service area near Dayton. **Raymond Brewer** will succeed Walker. **Rey Byrum** has the newly created post of supervisor of systems and procedures department with **Robert J. Fink** as his assistant. **William Abraham** replaces Fink as supervisor of machine customer accounting department.

Boston Edison Co announces the appointment of **William M. Syran** to head their advertising and promotion department in the Television Division. Syran previously was district manager in the public relations department.

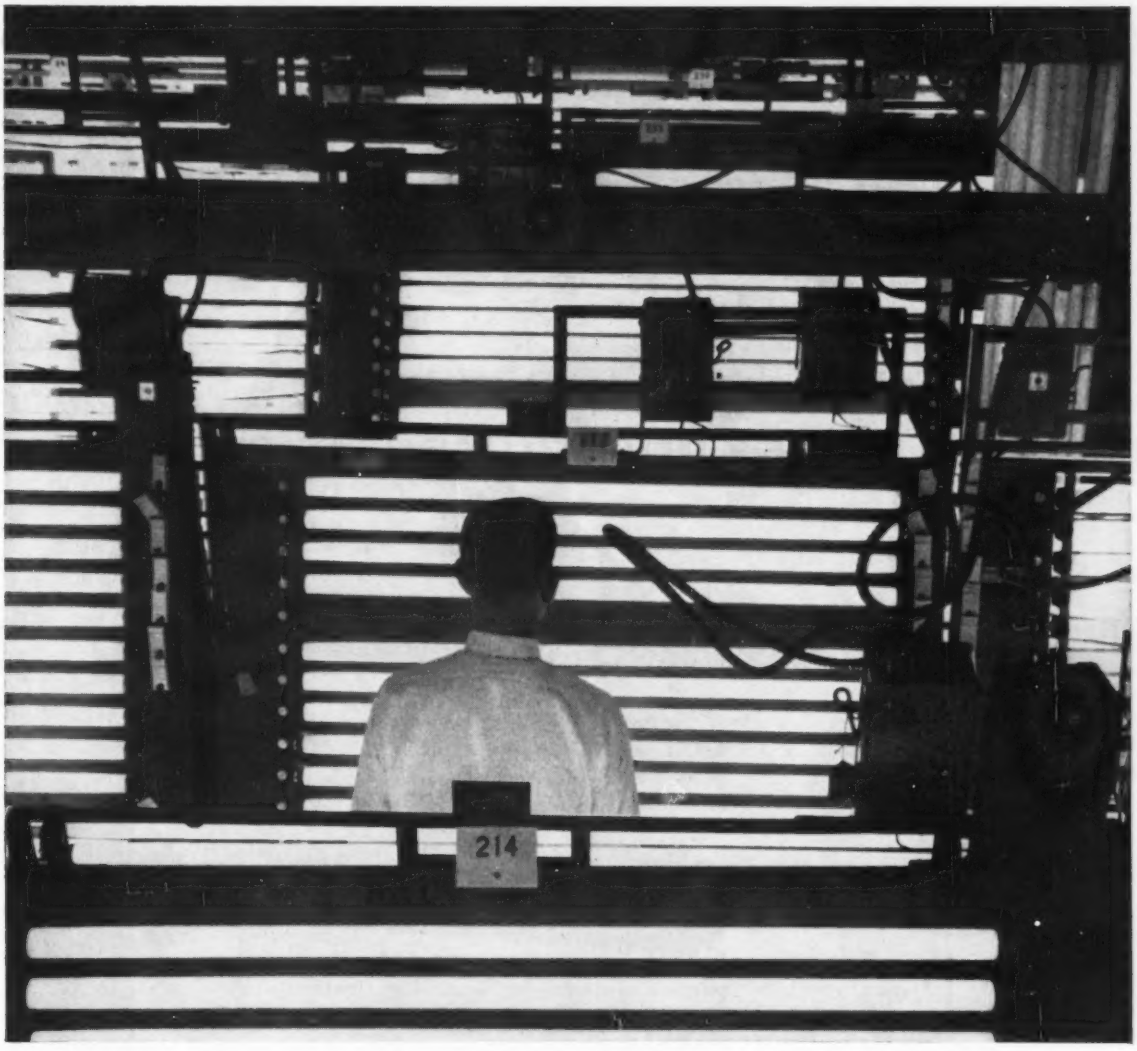
New post for **Robert H. Laws** is consultant in industrial relations department of Commonwealth Services, Inc.

Metropolitan Edison Co has named **J. Gordon Reber** manager at Lebanon succeeding **Richard E. Dreas** who becomes manager at Easton.

Newly appointed director of research at the Army Corps of Engineers Research and Development Laboratories, Fort Belvoir (Va.) is **Dr. George H. Hickox,** former program director for engineering sciences of National Science Foundation.

(*Continued on page* 290)

how to judge a fluorescent lamp . . . point no. 7



ask about **QUALITY CONTROL**

You would never guess it from their price, but fluorescent lamps today are *precision* products. (In Westinghouse fluorescent lamps, for example, you'll find mercury measured with the precision of a doctor's prescription, electrodes wound with fine-watch accuracy.) Thus only the closest quality control can give you the high light output, the long life, the good color qualities you expect from every single lamp you buy. Westinghouse quality control includes *480 inspections and tests* for every lamp produced.

WATCH WESTINGHOUSE

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

HERE'S PROOF:

9 OUT OF 11 UTILITIES PREFER BAILEY INSTRUMENTATION

In October, 1955, eleven electric utilities added a total of 966,619 KW of steam generating capacity. The installations ranged from 6,000 KW up to 270,000 KW.

9 of the 11 installed Bailey meters
7 of the 11 have Bailey combustion control
9 of the 11 are using Bailey feed water control
6 out of 10 use Bailey steam temperature control

In 31 out of a possible 43 applications in these power plants, Bailey equipment was chosen. And in 6 of the 11 stations, Bailey was the exclusive choice in all applications.

This unanimity of preference for Bailey . . . from Michigan to Georgia, from Maine to California . . . suggests just one conclusion:

Regardless of plant size, regardless of plant location, Bailey is the first choice of America's utilities.

Make Bailey your choice.

For breadth of product line, depth of experience, size of field service organization, no one offers more to the power industry than Bailey. And the time to contact Bailey is during the early planning stage when our recommendations can save time, trouble and money.

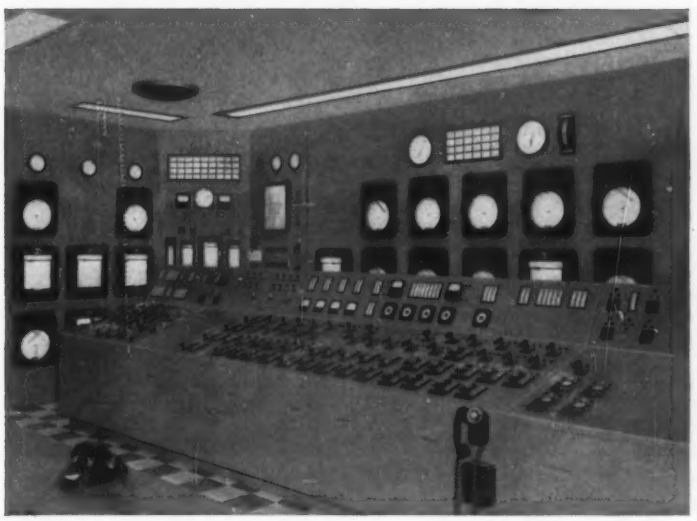
NEW STEAM-ELECTRIC GENERATION PLACED IN OPERATION DURING OCTOBER 1955

SOURCE—REPORTS TO FEDERAL POWER COMMISSION AS PUBLISHED IN ELECTRICAL WORLD DEC. 12, 1955

STATE	UTILITY	PLANT	CAPACITY (KW)	METERS ON BOILER	COMB. CONT.	F.W. CONT.	S.T. CONT.
Maine	Central Maine Power Co.	Mason	30,000	X	X	X	X
N. Y.	New York State Electric & Gas Corp.	Milliken	108,000	X	O	X	O
Ohio	Ohio Edison Co.	R. E. Burger	270,000	X	O	X	X
Ind.	Crawfordsville Electric Light & Power Plant	Crawfordsville*	11,500	O	O	O	O
Ind.	Indiana-Kentucky Electric Corp.	Clifty Creek	180,000	X	X	X	X
Mich.	Upper Peninsula Generating Co.	Presque Isle	22,000	X	X	X	O
Kans.	Central Kansas Power Co.	Colby	6,000	X	X	X	
Ga.	Georgia Power Co.	Hammond	100,000	X	X	X	X
Tex.	West Texas Utilities Co.	Paint Creek†	30,000	O	O	O	O
Calif.	California Electric Power Co.	Highgrove	40,000	X	X	X	X
Calif.	Pacific Gas & Electric Co.	Morro Bay	169,118	X	X	X	X

Code: X—BAILEY, O—OTHERS. *Bailey Fluid Meter †Bailey Oxygen and Combustibles Recorder

A129-2



In the control room of Hammond station, Georgia Power Company, they use Bailey meters and Bailey controls for combustion, feed water, and steam temperature. Out of October, 1955's steam plant additions, some Bailey equipment was chosen for each of the 11 plants.

Instruments and controls for power and process

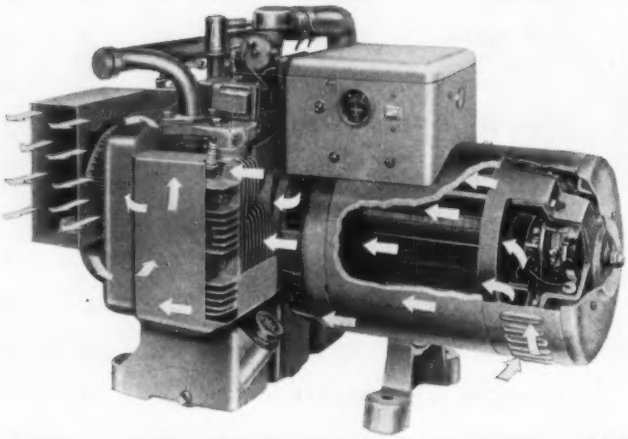
BAILEY METER COMPANY

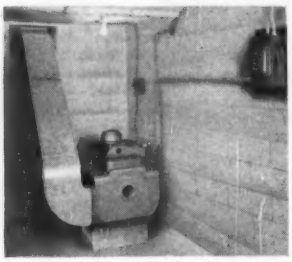
1060 IVANHOE ROAD • CLEVELAND 10, OHIO

In Canada—Bailey Meter Company Limited, Montreal

BAILEY METERS

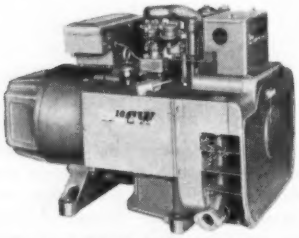
HOW Vacu-Flo AIR-COOLING SIMPLIFIES INSTALLATIONS OF ONAN ELECTRIC PLANTS





VENTILATES INSTALLATION AREA

Vacu-Flo cooling takes air from the room, through the electric plant, and expels it outside through a single duct. Eliminates fumes; keeps room filled with fresh air.



DUCT CARRIES EXHAUST LINE

On the Onan CW series of electric plants (7½ and 10KW), the exhaust pipe is carried through vent duct to the outside making only a single opening necessary.

Heated air expelled outside through single vent. Units can be enclosed or "buried"

Air-cooled Onan Electric Plants can now be installed in small, enclosed compartments; in isolated or underground rooms; or "buried" within a vehicle, far from the outside air. Previously impossible or difficult installations are now easy and practical with Onan Vacu-Flo cooling.

This exclusive system is a factory-equipped item, optional on any Onan air-cooled electric plant. A quiet-running, centrifugal blower in a specially-designed housing PULLS cooling air through the generator and over the engine . . . then EXPELS heated air through a duct to the outside.

The space required in a "buried" installation need be only a little larger than what the unit itself requires. Air-intake and vent openings plus an exhaust line are all that are necessary.

On vehicles such as trailers, display vans, fire and rescue trucks, and concession wagons, Vacu-Flo cooling makes it possible to mount the Onan plant anywhere in the body where space is available. On pleasure and work boats, Vacu-Flo cooling makes below-deck installations of air-cooled electric plants practical . . . cooling efficiently and quickly eliminating fumes from the area.

Onan Electric Plants with Vacu-Flo cooling operate more quietly than blower-cooled models . . . an important added advantage in many installations.

Write for Special Vacu-Flo folder.

D. W. ONAN & SONS INC.

2950 University Avenue Southeast, Minneapolis 14, Minnesota

PERSONAL BRIEFS

(*Continued from page* 286)

Charles F. Branum, formerly Ahoskie manager of Virginia Electric & Power Co, has been promoted to assistant superintendent of lines in the Leasburg, Warrenton, and Fairfax area.

The John Fritz Medal will be awarded to **Admiral Ben Moreell,** chairman of the board of Jones & Laughlin Steel Corp and chairman of the Task Force on Water Resources and Power of the Second Hoover Commission, at the national convention of American Society of Civil Engineers on Oct 17. The award is sponsored jointly by ASCE; American Institute of Mining, Metallurgical and Petroleum Engineers; American Society of Mechanical Engineers; and American Institute of Electrical Engineers.

James H. Lee has been named to succeed Commissioner **William B. Elmer,** resigned, as a member of the Michigan Public Service Commission. Lee is retired former assistant corporation counsel for Detroit.

Controllers Institute of America has announced the following appointments: **Frank Freer, Jr,** assistant comptroller, Public Service Electric & Gas Co, is president of the Newark (N. J.) control; **Edward Gardner,** assistant controller of Niagara Mohawk Power Corp, has been made secretary-treasurer of the Albany control; **Roy Dreiman,** assistant comptroller, Pacific Gas & Electric Co, is new treasurer of the local controllers' group; and **Arthur G. Green,** controller, Columbus & Southern Ohio Electric Co, has been named treasurer of the Columbus control.

James E. Hoffer has been named to the newly created post of local level manager of Operation Home Improvement's sales promotion campaign.

General Electric Co has appointed **Thomas S. Teague** manager of materials in the manufacturing section of the company's metallurgical products department.

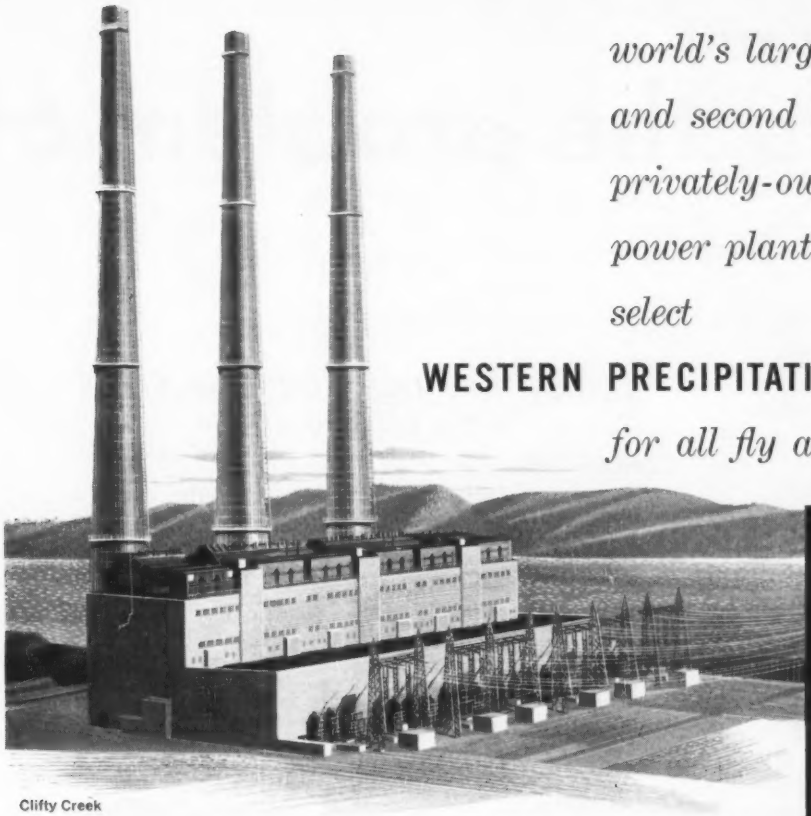
Babcock & Wilcox Co's **G. H. Rearick** has been appointed to the staff of Vice President **W. J. Thomas.** Succeeding him as Milwaukee plant manager, Tubular Products Division, is **Norman E. Wenzel,** assistant plant manager.

(*Continued on page* 294)

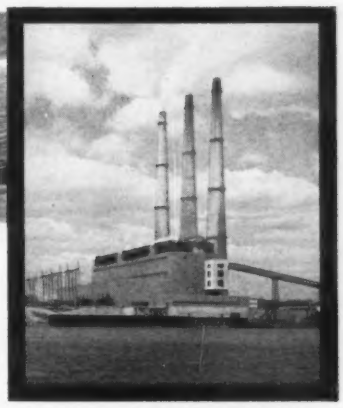
world's largest
and second largest
privately-owned
power plants
select

WESTERN PRECIPITATION CMP UNITS

for all fly ash recovery!



Clifty Creek



Kyger Creek

In the Ohio Valley area a new industrial miracle is now completed. Fifteen private utility companies have joined forces as the Ohio Valley Electric Corporation to construct the world's largest and the world's second largest privately-owned electric power plants.

The project is not only the largest single undertaking in the entire history of the electric utility industry, but also one of the most modern. *And it is highly significant that, with so much at stake, Western Precipitation integral CMP (Combination Multiclone-Precipitator) Units were selected to handle the entire fly ash recovery operation.*

At the larger of these two modern new plants—Clifty Creek Plant near Madison, Indiana—six CMP Units are installed. At the other—Kyger Creek Plant near Cheshire, Ohio—five CMP Units are installed. In both plants the recovery operation is identical. Flue gases from the boilers first pass through Multiclone sections where the heavier suspensions are mechanically recovered by small-tube *cyclonic* separators. The partially-cleaned gases then flow on into Cottrell Electrical Precipitators where final clean-up of even the extremely fine particles is effected.

Result

—by combining advantages of both mechanical and electrical recovery methods into one compact coordinated installation, very high recovery efficiencies are obtained at low installation and operating costs. And the CMP has the further advantage that overall efficiency remains uniformly high regardless of boiler loads—an important advantage not found in other types of recovery equipment.

Western Precipitation offers—in ONE experienced organization—years of progressive "Know-How" in all three basic types of recovery equipment . . . *electrical* (COTTRELL), *mechanical* (MULTICLONE) and *filter* (DUALAIRE). Not only does this assure you an unbiased recommendation on the type best suited to your particular requirements, but also assures maximum performance when integrating two types of equipment into one overall system.

We are equipped to handle complete "turnkey" installations—or any phase of a dust, fume or fly ash control problem. Throughout major industrial areas of the United States and Canada, we are as close as your telephone. May we serve you?

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Reverse-Jet Filters
HOLO-FLITE Processors

Western Precipitation Corporation

Designers and Manufacturers of Equipment for Collection of Suspended Material from Gases . . and Equipment for the Process Industries

Main Offices: **1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA**

Chrysler Building, New York 17 • 1 North La Salle Street Building, Chicago 2 • Oliver Building, Pittsburgh 22 • 3252 Peachtree Road N. E., Atlanta 5 • Hobart Building, San Francisco 4

Precipitation Company of Canada Ltd., Dominion Square Building, Montreal

Representatives in all principal cities

To help you with

the problem of

A. R. Lee, General Electric application engineer, discusses the many conditions affecting the selection of station control cables—and the wide variety of cable types available to handle the job. Recent General Electric cable developments, and men like Lee who work closely with electric utility engineers, are helping to simplify the complex problem of selecting the right control cables for these many conditions.

control cable selection

General Electric introduces a new cable

A number of application problems often face the electric utility engineer who must select the best control cable for a particular installation. Must he consider the electrostatic effects of adjacent power cables? Is it necessary for the cable to be flame-resistant? Will there be a problem of moisture, of high ambients, or of extreme cold?

In any event, there will be a combination of conditions which should be considered in the selection of the cable most suitable for the application.

Polyethylene Flamenol* Control Cable A new answer for most applications

Out of General Electric's experience in manufacturing *and using* control cables has come the development of another new type of control cable...a cable that will simplify many application problems. It is the new G-E polyethylene Flamenol* control cable. This cable can be used indoors or outdoors, in wet or dry locations, for aerial or direct burial installations. It combines the best properties of both polyethylene and polyvinyl chloride: the polyethylene insulation provides high dielectric strength, low moisture absorption, and low specific inductive capacity; the polyvinyl chloride jackets, both on the single conductors and over core, resist flame, moisture, oil, acid, alkali, sunlight, weather, and abrasion. The cable is rated 75 C copper temperature, 600 volts.

Extreme conditions may call for other cables

There is always the possibility of the extreme and unusual situation. In these cases the full line of General Electric control cables—and the G-E engineers who know them best—can be of particular help to you. These men, through their broad experience in working with electric utility engineers, have become familiar with (and have helped with the solution of) most of the application problems you will face.

For example, if your problem is moisture plus very high ambients, their answer will probably be a silicone-rubber insulated cable with asbestos braid. If you must have flexibility under conditions of extreme cold, Super Coronol* Geoprene* cable provides it. Even if you require resistance to atomic radiations, G-E Wire and Cable engineers can offer a special combination of insulating materials and jackets to do the job.

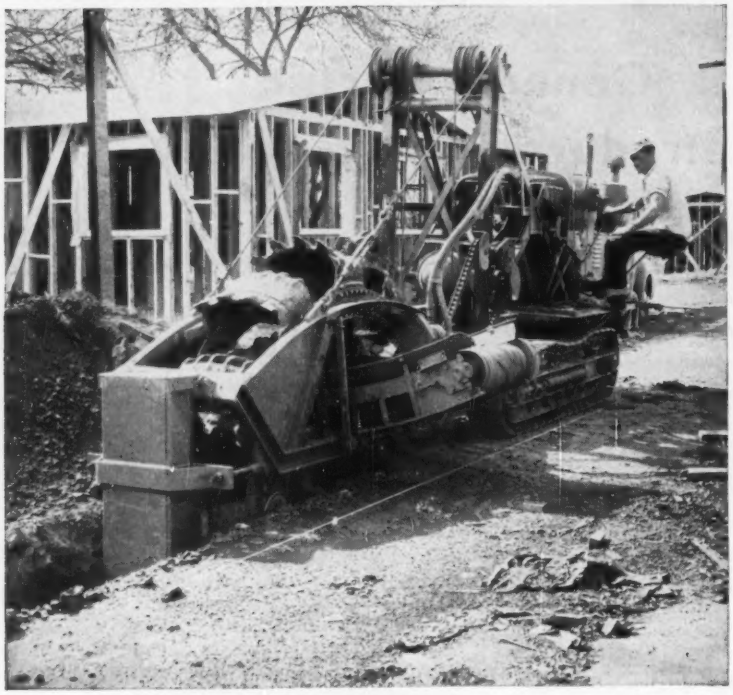
Whatever your control cable problem, General Electric can help you find the best answer. See your local G-E Wire and Cable specialist, or write Section W181-927, Construction Materials Division, General Electric Company, Bridgeport, 2 Conn.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

FASTER, MORE ACCURATE CONTROL FOR "Stop and Go" UTILITY DITCHING



ONLY Gar Wood Buckeye **HAS IT!**

Utility ditching requires frequent changes in travel and digging speeds for work in close quarters . . . frequent raising and lowering of digging wheel to protect existing pipe, cable and conduit. For "stop and go" work like this, Gar Wood-Buckeye's new job-proved 305 offers exclusive advantages:

Live hydraulic wheel hoist provides faster, more accurate positioning of the digging wheel, independent of all other operations. It's operated from the seat by simple, one-hand controls.

Hydraulic conveyor drive provides three discharge speeds in either direction . . . instant adjustment to handle any volume of spoil independent of any other function. No complicated shifting, no need to stop digging wheel or crawlers.

Track-type crawlers on the 305 let you dig regardless of ground conditions . . . tread lightly to protect lawns and sidewalks . . . last longer, cost less to maintain. Transmission is specially designed for "stop and go" operations...any travel speed can be obtained with any digging wheel speed.

The 305 digs to 5 feet, 6 inches deep; 12 to 24 inches wide in 2-inch steps. To get all the facts about this advanced ditcher, call your Gar Wood-Buckeye dealer, or write: Customer Service Department, Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Findlay, Ohio

Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.

Gar Wood Truck Cranes | Gar Wood Winches | Gar Wood-Buckeye Ditchers | Gar Wood Truck-Mounted Cranes | Gar Wood-St. Paul Hoists & Bodies

Personal Briefs

(*Continued from page* 290)

The Order of Merit, highest honor of Westinghouse Electric Corp can bestow for outstanding achievement, was awarded recently to three officials—**Karl M. Patterson,** manager of the industrial sales department, Apparatus Division; **Harold L. Cramer,** sales manager, agency and construction department, Apparatus Division; and **Standish H. Harrison,** Pacific Coast regional manager of industrial sales . . . **C. J. Burke** and **E. J. Fogel** have been promoted to sales manager and manufacturing manager, respectively, of the company's newly created industrial gas turbine department at the Lester, Pa., plant . . . Recent advancement of **Joseph G. Carroll** from works manager of the Westinghouse lamp works in Little Rock (Ark.) to manager of the Ken-Rad lamp department has resulted in appointment of **Charles T. Nichols** to assume Carroll's former post. Nichols will continue as manager of the company's Southern lamp plants.

Robert B. Jackson, general superintendent and assistant manager of Koppers Co's Baltimore Division, has been named by Grant County PUD of Ephrata, Wash., as its resident engineer for construction of $100-million Priest Rapids Dam, recently contracted.

New vice president and general manager of Philco Corp's Appliance Division is **Harold W. Schaefer,** vice president of the division since 1952. He succeeds **Raymond A. Rich,** resigned. Corporation Vice President **Larry F. Hardy** has assumed a new post as vice president in charge of Consumer Products Divisions, including Television, Radio, Appliance, and Automotive Divisions.

Institute of Radio Engineers has named **Dr. Julius A. Stratton,** chancellor of Massachusetts Institute of Technology, to receive its 1957 Medal of Honor for "his inspiring leadership and outstanding contributions to the development of radio engineering as a teacher, physicist, engineer, author, and administrator."

Henry F. Callahan, general manufacturing manager of the Lighting Division of Sylvania Electric Products, Inc, has been named general manager of the division.

(*Continued on page* 298)

CF&I GALVANIZED STEEL STRAND

for guy, messenger and overhead ground wire . . . quickly available from both eastern and western plants

No matter what part of America you're in, CF&I can quickly supply your needs for top-quality, guy, messenger and overhead ground wire. That's because three- and seven-wire CF&I Galvanized Steel Strand is made at both Buffalo, N. Y., and Pueblo, Colo.—a combination of plant sites that's ideal for speedy, nationwide distribution.

What's more, you can be sure of the quality of CF&I Galvanized Steel Strand because every phase of its production is supervised by the manufacturers of world-renowned Wickwire Wire Rope and Wire Rope Slings.

Next time you need strand—whether it's to your own specifications or to ASTM Specifications A-122 or A-363—be sure you explore the many advantages offered by CF&I Galvanized Steel Strand. Better still, contact your nearby CF&I representative today.

GALVANIZED STEEL STRAND

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise
Boston • Buffalo • Butte • Chicago • Denver • Detroit
El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans • New York
Oakland • Oklahoma City • Philadelphia • Phoenix
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Seattle • Spokane • Wichita

CF&I OFFICE IN CANADA: Toronto

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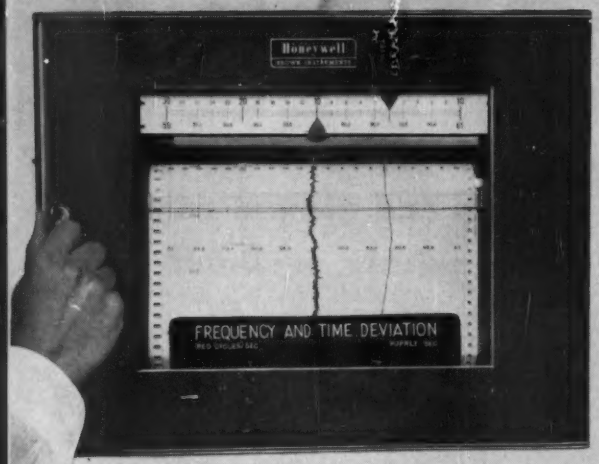
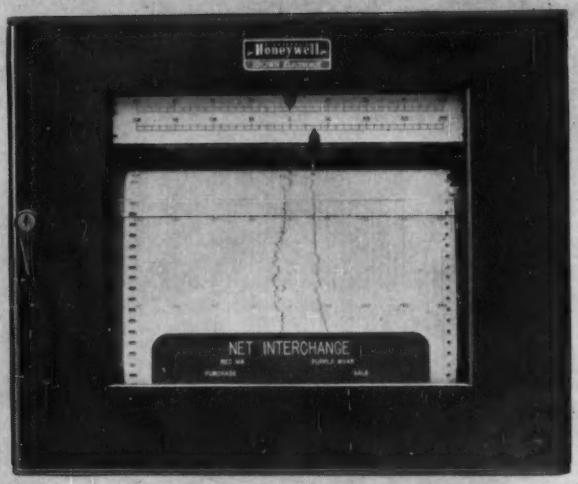


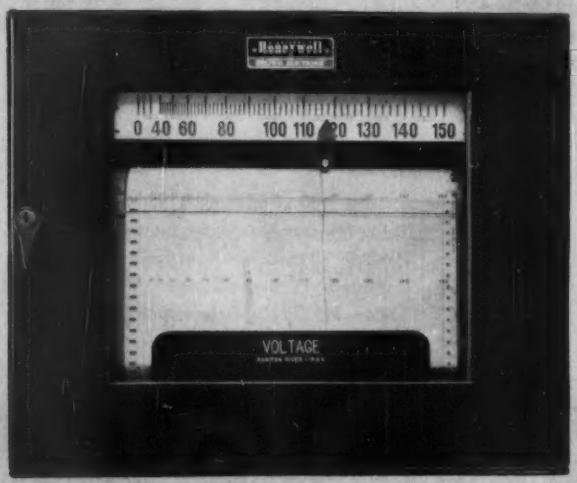


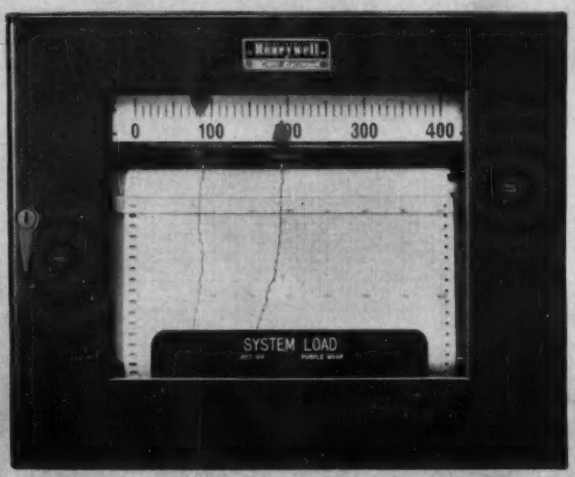
ElectroniK instruments can record . . .

system load
net interchange
voltage
frequency

time deviation
total generation
station generation
tie line loads
sky illumination

outside air temperature
outside humidity
wind velocity
wind direction





Data recording instruments . . .

to deliver dependably

the facts

your dispatcher needs

WHAT are the facts that your dispatcher should know, to keep up with what's going on in your system?

Variables important to him are listed on opposite page. *ElectroniK* instruments record and indicate these variables with the precision, speed and sensitivity that you've come to expect of Honeywell instruments . . . plus the dependability that you demand of all your equipment.

Your maintenance men will rarely have to perform more than periodic preventive service when *ElectroniK* instruments are at work. Every component is engineered for continuous service, with ample extra ruggedness. You can depend on *ElectroniK* instruments to deliver uninterrupted performance week after week. They have a reputation for staying on the job, in dispatchers' offices, power stations and in thousands of industrial plants.

Ask your local Honeywell field engineer to talk over the ways you can use these instruments in your own system. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA: Write for Bulletin 9070, "Instruments for Electrical Power Generation."**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

ELECTRICAL WEST readers

WILL SPEND $775,095,000 A YEAR FOR THESE PRODUCTS!

Highlights of a Product Market Study just released showing the annual purchases of ELECTRICAL WEST readers:

1.	Steel Products for Electrical Utilities	$ 71,575,000
2.	Mechanical Equipment—Power Stations	59,015,000
3.	Electrical Generating Equipment	41,200,000
4.	Substation Equipment	62,300,000
5.	Transformers	88,420,000
6.	Overhead Line Equipment	57,565,000
7.	Meters, Instruments, Controls	10,985,000
8.	Communication Equipment	4,910,000
9.	Power Circuit Equipment	134,680,000
10.	Wire and Cable	87,845,000
11.	Lighting Equipment	142,660,000
12.	Miscellaneous Utility Equipment	13,940,000

The complete study covers 84 products in the above groups. For a copy ask your nearest McGraw-Hill office, or write to ELECTRICAL WEST, 68 Post Street, San Francisco 4, Calif.

ELECTRICAL WEST has more electrical industry subscribers in the 11 Western States—by far—than any other publication. This magazine gives electrical advertisers extra coverage and penetration of the fastest growing portion of the electrical market. It belongs on every electrical advertising schedule.

Your sales will expand in the growing West if you advertise in

ELECTRICAL WEST

68 POST STREET SAN FRANCISCO 4, CALIFORNIA

A McGRAW-HILL PUBLICATION

PERSONAL BRIEFS

(*Continued from page* 294)

Recently named general manager of Duff-Norton Co's Coffing Hoist Division was **M. Cleighton Hilbert,** former plant manager of Crescent Industries . . . **Richard M. Regan** has been appointed eastern traffic manager of Minnesota Mining & Manufacturing Co, with jurisdiction over traffic of plants from Buffalo, N. Y., to Miami, Fla.

Dr. George S. Crampton, inventor of the "Gasmainscope" and past president of Illuminating Engineering Society, has been chosen to receive the society's highest award, the 1956 Gold Medal.

OBITUARY

Charles E. Bennett, 74, retired inventor of the high pressure pipe-type electric transmission system and former manager of Okonite Co's oilostatic department, died recently in Ridgewood, N. J. Bennett, who once served as cable engineer for Allegheny County Light Co and as electrical and general engineer for Georgia Power Co, held numerous patents, including one for a lightning arrester and another for a ground rod. He designed and supervised the construction of the nation's first 100-kv substation and the first 110-kv transmission line.

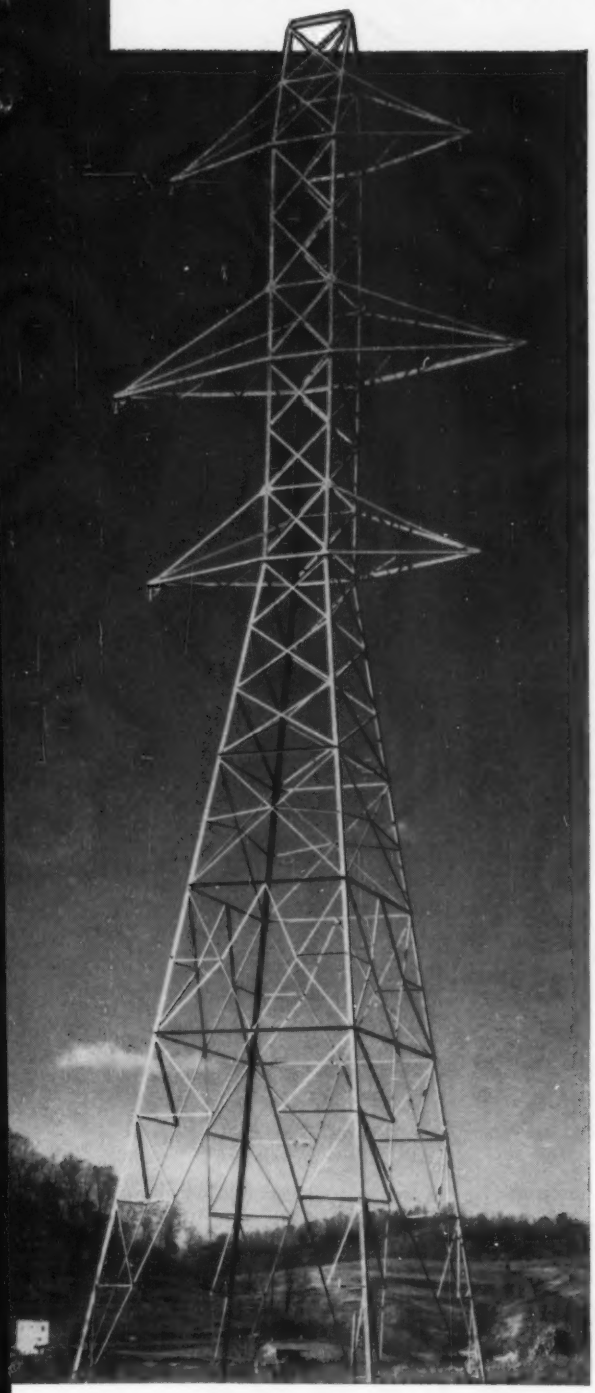
James W. Bryan, 82, chairman of the Kitsap County PUD, Port Orchard, Wash., died recently in Seattle. He formerly represented the PUD as attorney in court cases protesting the proposed sale of Puget Sound Power & Light Co to a group of PUD's.

M. E. Buck, 78, retired vice president and general superintendent of Montana Power Co, died recently in Butte.

William H. Feller, 67, retired secretary of Public Service Electric & Gas Co and subsidiary companies, died after a prolonged illness.

William J. Palmer, 66, vice president in charge of manufacturing since 1952 for Phelps Dodge Copper Products Corp, died recently of a heart attack in his New York office. Prior to joining Phelps Dodge in 1937, he was production manager for the Rome Division of Revere Copper & Brass Co.

How to Save Money on TOWERS—



Transmission towers aren't bought from stockpile. They have to be "tailored" for the job . . . to meet the conditions existing, or those which you may expect to encounter in your area.

That is why, if you want to obtain the best possible towers for your line at the lowest possible price, you should weigh *all four* of the following points very carefully before placing an order:

1. COST OF TOWER DELIVERED TO YOU—Since 1911, American Bridge has operated a plant which specializes in electric transmission towers, substations and similar structures. Its modern equipment and facilities were designed specifically for that purpose, and savings accomplished assure you a quality product at the lowest possible cost.

2. COST OF FOUNDATIONS—American Bridge strives to keep foundation costs low in its tower design. The rotated-type tower and circular grillage are two examples of how American Bridge works with its customers in a cooperative effort to reduce foundation costs.

3. COST OF TOWER ERECTION—The tower members furnished by American Bridge fit in the field. *Ask any tower erector to verify this fact.* Members are made alike on all four sides to facilitate erection. The same diameter bolts are used throughout the structure. These are sorted, packed and marked so that no time is lost looking for the right bolts for the connections; and the bolts themselves are the best obtainable. The nuts can be screwed on by hand preparatory to final tightening. Every member is stamped in the steel with its correct number to coincide with easily read erection drawings. *The fundamental reason for all this is to save you money.*

4. COST OF MAINTENANCE—All American Bridge towers are galvanized *after* fabrication by the hot-dip process. The resultant coating of pure zinc lasts for years.

Every American Bridge Tower is Designed to Meet Specific Conditions

American Bridge towers are carefully designed for the specific conditions of loading expected on your line. The dead load, the wind, the ice, angles in line, broken conductors, etc.—if they are to be expected on your line, the towers are designed to take them.

American Bridge is the leading tower fabricator in America. To get there required that we be better . . . to stay there, we will continue to provide quality structures competitively and on time.

It will pay you to call our tower experts on your next job.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION • GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY HOUSTON • LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN BRIDGE

USS

UNITED STATES STEEL

100% VITRIFICATION of porcelain is proved in a dye penetration test. As one of 77 production controls of Locke* suspension insulators, pieces of fired shells are immersed in dye under 10,000 lbs./sq. in. pressure for six hours. Slightest dye penetration causes rejection of entire lot.

BELOW: Re-breaking of immersed porcelain piece confirms non-porosity by absence of dye absorption along broken edge.

How good can an insulator be? CONSIDER THESE TESTS OF

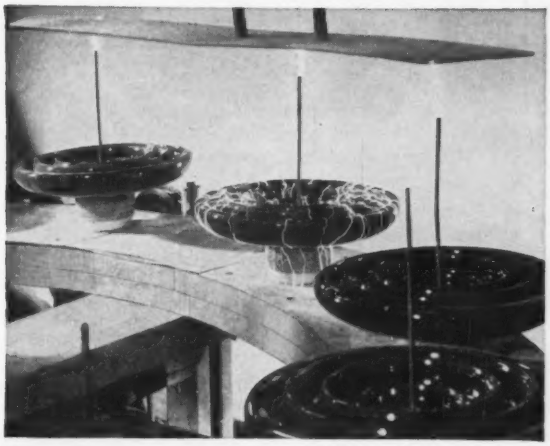
Satisfactory micro-structure of the fired insulator shell, assuring mechanical and electrical soundness, is an absolute *must* before it is allowed to become part of an insulator for your lines.

While the completed porcelain may appear solid, smooth and uniform at an outward glance, only close microscopic examination and other tests can prove it homogeneous, non-porous and properly glazed. Porcelain must be completely vitrified. For satisfactory composition, density must be uniform and within narrow limits.

Glaze must be of prescribed thickness to obtain maximum mechanical strength. The procedures shown above are individually scheduled as dictated by sound engineering judgment. They are your assurance of the dependability of each Locke insulator.

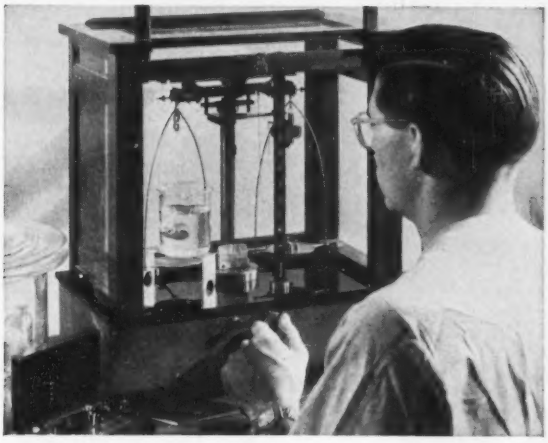
The case of Fired Porcelain "Quality Control" is typical of the extremes to which General Electric goes to assure trouble-free service on your system.

For a brief and complete picture story of insulator quality control, simply ask your General Electric Insulator representative or write to Insulator Department, General Electric Company, P. O. Box 57, Baltimore, Maryland.



FIRST ELECTRICAL TEST of porcelain shells follows firing. Moving on a conveyor, they must withstand a 3- to 5-second flashover test at about 200 kilocycles without puncture.

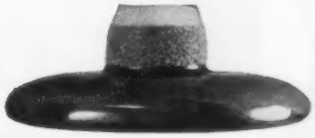
EXACT GLAZE THICKNESS, vital to the mechanical and electrical strength of the finished MICROGLAZE* insulator, is accurately determined by microscopic measurement.



FIRED DENSITY TEST—As the specific gravity of properly vitrified porcelain falls within a very narrow range, it is possible through this test to detect very small deviations from satisfactory composition.

TISSUE THIN PORCELAIN sections, when examined through a petrographic microscope, reveal their crystalline structure and state of maturity.

FIRED PORCELAIN



Progress Is Our Most Important Product

GENERAL ELECTRIC

*Trademark of General Electric Company

M & M BRUSH CHIPPERS

convert 3000 lbs. tree trimmings into small chips in 1 hour

A portable, highly efficient unit with its own power plant, the M & M Brush Chipper converts a truckload of useless brush into a small pile of chips in 21 minutes. The chips make excellent fuel, and can also be used for livestock bedding or mulch. The M & M Brush Grinder will handle branches (green or dry) up to six inches in diameter, and will deposit them in a truck or container or in a neat pile on the ground. The M & M Brush Grinder has a standard trailer hitch for towing behind car, jeep, or truck, and a retractable wheeled jack for levelling when detached from towing vehicle. Moving parts are fully enclosed for safety, and the whole unit is ruggedly constructed for long, hard service. Write today for illustrated folder.

MITTS & MERRILL 1002 South Water Street • SAGINAW, MICHIGAN

94

SUPERIOR SWITCHBOARD & DEVICES CO.

CANTON, OHIO

A subsidiary of The Union Metal Manufacturing Company

St. Lawrence Project

(*Continued from page* 143)

mounted lens fixtures, mounted 40 ft on centers on each side of the deck directly opposite each other.

Ceiling Lighting New Type

The main control room will have the most modern and latest plastic prismatic lens luminous ceiling extending from wall to wall with a total area of approximately 4,000 sq. ft. This is the first such control room luminous ceiling installation in this country using prismatic lenses. With such a controlled lighting distribution in all directions, the operators will enjoy a minimum of glare and maximum comfort. The ceiling itself is suspended from the concrete floor above. The center portion of the ceiling will be 6 in. lower than the main section. A 20-deg slanted transition section between the levels of the two ceilings will provide space for supplementary control board lighting units, emergency lights, and air conditioning outlets. The fluorescent lighting source is located approximately 12 in. above the plastic ceiling.

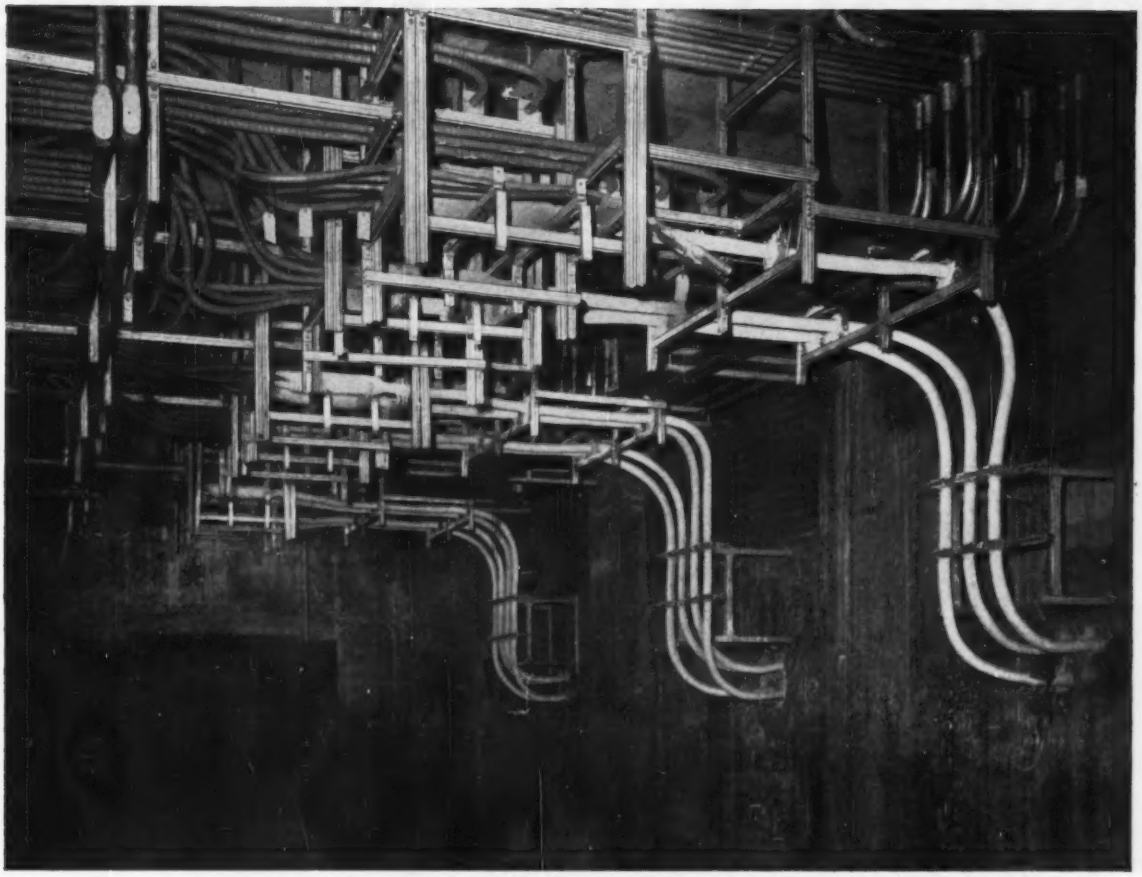
Light Can Be Varied

The average illumination on a horizontal plane 30 in. above the floor will be approximately 110 ftc. The average illumination on the face of the vertical instrument panels with the supplementary board lights will be approximately 67 ftc. Variations of the light intensity from full brilliancy to black-out is obtained through three fluorescent light dimmers remotely controlled by the operator at his desk.

Switchyard Light Attractive

Because the switchyard will be located on the main access road leading up to the power plant and can be seen by millions of visitors, a mercury vapor lighting installation has been selected to produce a sensational effect as well as its intended purpose of good illumination. The average illumination on the disconnect switches will be approximately 10 ftc and approximately 2 on the ground. The lighting system will be automatically controlled by photoelectric switches or manually by the operator in the control room.

The transmission line requirements have not been fully developed at present, but the switchyard is designed to accommodate a maximum of eight 115 and six 230-kv circuits.



High voltage cable support and conduit racking in large municipal power plant.

How UNISTRUT® framing makes complicated electrical installations quicker, simpler

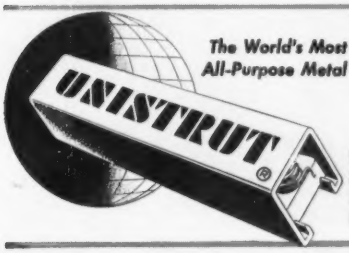
Looking for a modern, foolproof way to speed up complicated supporting of conduit, cable and other electrical equipment?

Extra strong, all-steel UNISTRUT adjustable framing is your answer—you assemble it right on the job from stock UNISTRUT channel and fittings. Concrete inserts, clamps, insulators—all are available in the complete UNISTRUT System. Costly welding, drilling and riveting are eliminated—with UNISTRUT, everything bolts together; fittings are attached and adjustments made while work progresses. And you get a clean, professional installation strong enough to support the heaviest run.

You'll also want to know about UNISTRUT for wire raceways. With this unique system (listed by Underwriters' Laboratories) you run lines for both power and light *inside* the UNISTRUT channel—making a flexible installation that accommodates irregularities, and permits wiring in at any point.

For complete information on these most modern electrical installations, send now for UNISTRUT Bulletins. Consult your telephone directory for name of nearest UNISTRUT Distributor.

UNISTRUT PRODUCTS COMPANY
933 W. Washington Blvd., Dept. W-9
Chicago 7, Illinois



The World's Most Flexible All-Purpose Metal Framing

U.S. Patent Numbers:
2327587 2329815 2380379 2363382
2345650 2541908 2405631 2696339
Other Patents Pending

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Dept. W-9, 933 W. Washington Blvd.
Chicago 7, Ill.

- ☐ Please send 78-page General Catalog 700 (framing).
- ☐ Please send Bulletin FF5 (lighting).
- ☐ Please have your salesman call, no obligation.

Name.....

Address.....

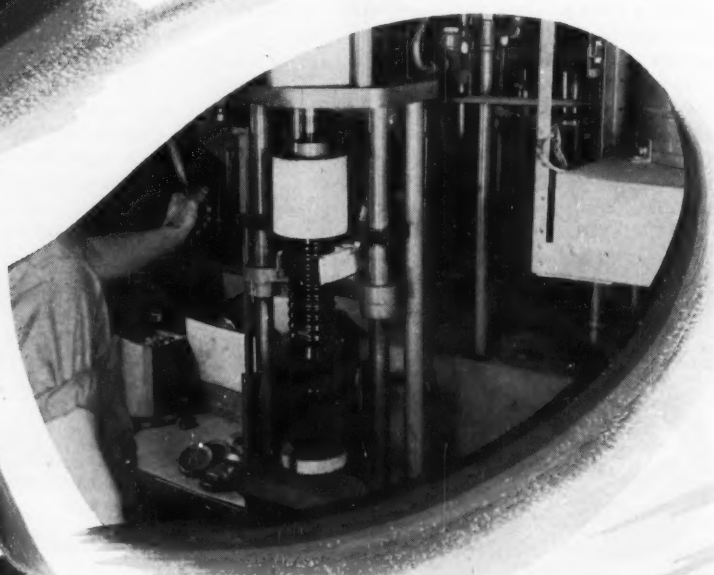
City.....*Zone*....*State*.....

CRYSTAL VALVE ARRESTERS

Service Engineered . . .

DEVELOPMENT

More than 60 years of specialization in the manufacturing of lightning arresters . . . plus extensive laboratory and field tests assure arresters designed, developed and engineered for positive protection.



MANUFACTURING

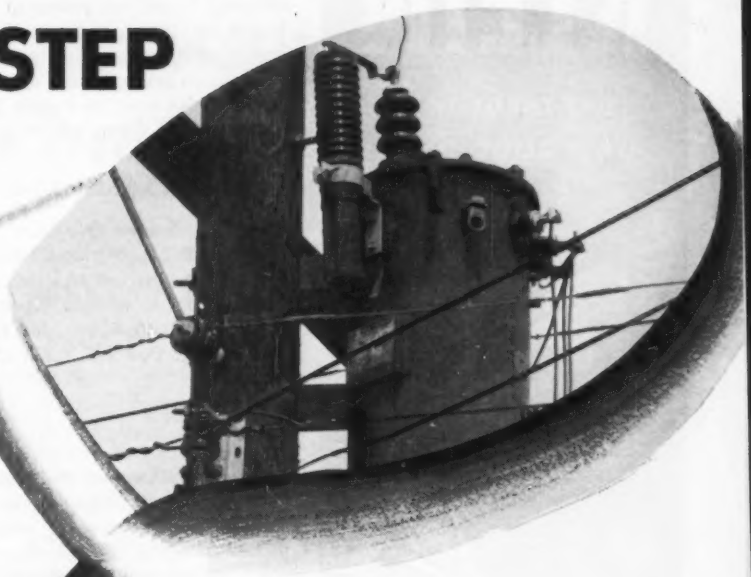
Every step in the manufacture of Crystal Valve Arresters is engineered for unfailing service. Perfect valve action element, moisture-proof sealing, ultra speed spark-gap structures are all built into every C.V. Arrester.

HKP

Electric Service Works,

17th AND CAMBRIA STREETS

IN EVERY STEP



PERFORMANCE

The service engineered into C.V. Arresters has proved itself by years of performance in every major utility company in the U.S. and throughout most of the world. The record of C.V. Arresters proves them to be the best available.

SERVICE

Strategically located warehouse and factory stocks save on inventories needed. You are assured of speedy, accurate, efficient service in handling your requirements.

For real service that is engineered in every step to give you positive protection of your lines take the step now to CRYSTAL VALVE "Service Engineered" ARRESTERS. Write for full details.

DELTA-STAR ELECTRIC DIVISION, H. K. PORTER COMPANY, INC.

PHILADELPHIA 32, PA.

KLEIN

THE THRILL THAT ONLY GOOD TOOLS CAN GIVE

"Since 1857"

It's a pleasure to use good tools —pliers that grip tight . . . that cut through tough wire easily . . . that reach confined spaces.

Linemen and electricians know that they can rely on their Kleins—side cutters, long nose, oblique cutters—famous for quality for a century.

There is a Klein Plier exactly suited to every electrical need—carried in stock by better electrical suppliers everywhere.

Write for your FREE copy of the Klein Pocket Tool Guide listing Klein equipment and giving valuable information.

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

News In Brief

(*Continued from page* 130)

authority to provide power to a 13-section area south and east of Worland. Territory was originally allocated to Mountain States Power Co and later the franchise went to Pacific Power & Light Co when the two firms merged.

Property Transfers

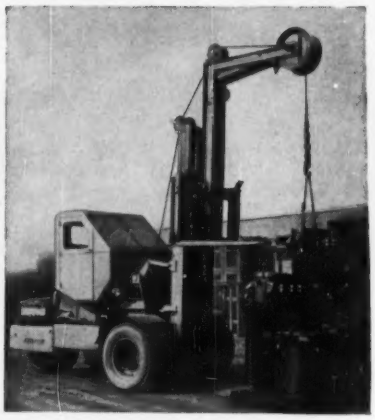
Lincoln Service Co has asked Wyoming Public Service Commission approval to purchase two small electrical utilities in western Wyoming—D. A. Blackmon & Son, for $1,000; and LaBarge Power & Light Co, for $6,000.

Miscellaneous

Indianapolis P&L plans to make it **easy for people to hear their company story** and that of free enterprise. Six ready-made programs are being prepared. Two will be talks, two will be films and two will be demonstrations. IP&L will be prepared to provide speakers on short notice for luncheon clubs, civic organizations, and affiliated clubs of the seventh district Indiana federated clubs. Those responsible for programs will be advised of the availability of these speakers and the nature of the programs available.

Appalachian Electric Power plans an **8-station, 145-mile microwave system** to connect its offices in Roanoke, Va., and Charleston, W. Va. The system is designed to provide 10 channels for both voice and teletype . . . For the second straight year, **Arkansas P&L has won an Award** for Merit from Research Institute of America. Award cites AP&L's sales program in which employees fill out cards for prospects for electric appliances. These "prospect cards" are turned in to company supervisors and are then sent to appliance dealers.

Eight of every 10 new homes connected last year to Nashville (Tenn.) Electric Service system are using **electricity for heating purposes.** There were 28,125 homes on the NES system that used electric heat as of June 30, the system's 1955-56 fiscal-year report shows . . . Carolina P&L Co has given a refresher course to its key engineers on the **"hurricane plan"** for rapid mobilization when a howler approaches. After the alert is sounded,



Every Movement has a SAVINGS of its own . . . . .

SAVE UP TO 75% of MATERIALS HANDLING COSTS WITH

HEAVY-DUTY FORK
LIFTRUK
OR
LIFT-O-KRANE

Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

The LIFTRUK *Fork Lift Truck* and LIFT-O-KRANE *Combination Crane and Fork Lift Truck* handle capacity loads with maximum stability and safety. They have high lifting range. Make short turns in narrow spaces. Promote maximum efficiency for storage areas . . . and effect rapid inloading and outloading, with economic use of manpower.

Send for Bulletin 77 for LIFTRUK. Bulletin 75 for LIFT-O-KRANE

Makers of KRANE KAR Mobile Boom Crane, KARRI-GO Front Boom Crane, SILENT HOIST Cranes for Motor Truck Mounting, SILENT HOIST Winches and Capstans, SILENT HOIST Hydraulic Telescopic Truck Towers, etc.

SILENT HOIST & CRANE CO.
Pioneer Manufacturers of Heavy-Duty Equipment for Public Utilities and Municipalities
862 63RD STREET, BROOKLYN 20, N. Y.

ROCKBESTOS VARNISHED-CAMBRIC CABLE

Quality Engineered to Provide Superior Performance

NOTE THESE UNUSUALLY HIGH STANDARDS FOR VARNISHED-CAMBRIC TAPES

Rockbestos VC tapes are made to our own exacting specifications which incorporate all the requirements called for in all IPCEA Standards.

PLUS

- A special surface treatment applied to insure that the tape will wrap properly to provide uniform dielectric strength and good bending characteristics in the completed cable.
- More rigid tape thickness requirements to insure uniformity of cable diameters.
- Rockbestos special Surface Hardness Test, not found in industry standards, insures varnish film that will not become damaged in processing or handling which the cable may get in service.
- Controlled methods of application of tapes avoid overstress of tapes assuring uniform dielectric insulation throughout the entire length of the cable.
- Add to this thirty years of know-how in the application of VC tapes for high temperature application on Rockbestos AVC cables and you have a VC cable that insures trouble-free operation and long life.

Rockbestos Braided *Varnished-Cambric* cables are stocked in 600 volt and 5,000 volt ratings for *immediate delivery.*

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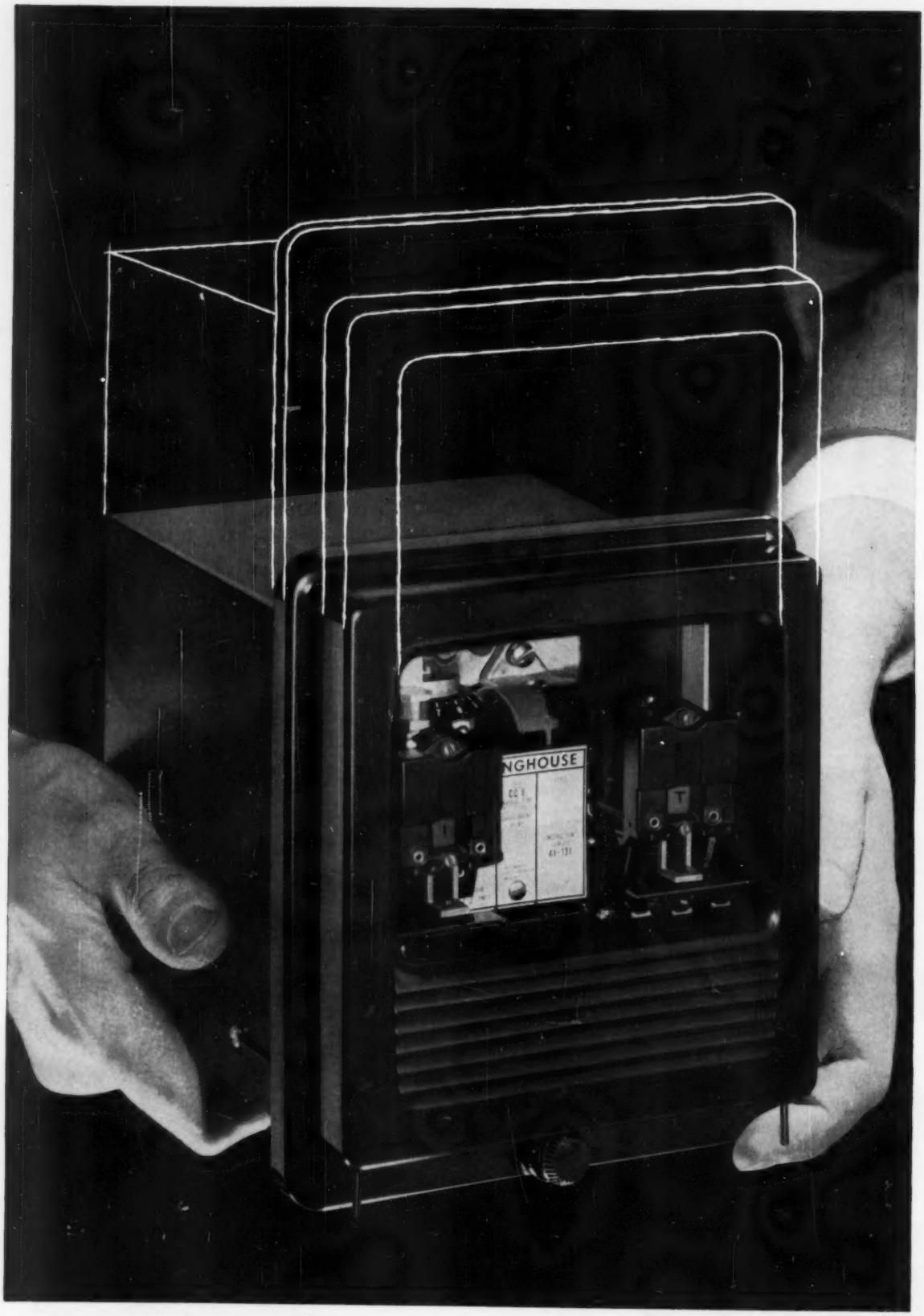
PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • LOS ANGELES
OAKLAND, CALIFORNIA • NEW ORLEANS


NGHOUSE

Good news about relay design:

Size reduced one-third . . . panel space saved, improved operating features

New-design Westinghouse relays and Flexitest* cases are one-third smaller than previous designs, enable you to mount more relays per panel. Result: significant savings in space and construction costs.

Even though these units are more compact, components are more readily accessible . . . and operating efficiency has been improved.

This advanced design offers other important benefits, too. A universal case design permits either semi-flush or projection mounting. Number of styles has been reduced two-thirds to simplify ordering and stocking. Modern lines give case an attractive appearance.

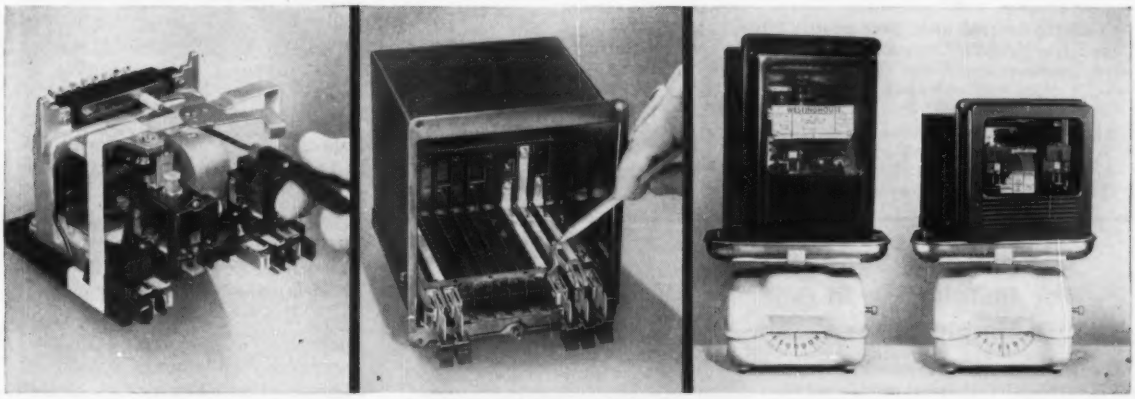
Whether you buy or build switchboards, be sure to specify new-design Westinghouse relays in Flexitest cases. They'll help you save space, assure reliable relaying operation, simplify maintenance and testing.

For further information about these newly designed relays and cases, contact your Westinghouse sales engineer and ask for a copy of B-6578, or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40484

*Trade-Mark

COMPARISON OF SPACE REQUIRED — OLD AND NEW RELAYS

Type Relay	CO		CV		CR	
	Old	New	Old	New	Old	New
Number of relays in same space	5	7	5	7	5	8



Accessibility—New-design chassis frame allows ready inspection and adjustment of operating elements. New latching arms provide positive locking for chassis, open for removal of operating unit.

Ease of Inspection—Strap-type connectors from switch blade to case terminal are visible, eliminating tracing circuit. Position of short-circuiting contacts visible even with relay unit in case.

Less Weight—Units weigh one-third less than earlier designs . . . are easier to handle and save customer stocking space. Although unit is more compact, it sets a new high in performance.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

PREMAX

METAL MARKERS
ATTACH IN SECONDS
AND LAST FOREVER

Premax letters, figures and special tags insure positive, permanent identification for all utility poles, towers and installations. Made of stamped or embossed brass or aluminum to retain high legibility regardless of weather.

R. E. A. approved. Ask your dealer or write:

PREMAX PRODUCTS

Div. CHRISHOLM-RYDER Co. Inc.
5651 Highland Ave., Niagara Falls, N. Y.

PREVENT CONDENSATION

maintain dry humidity

SYNTROL

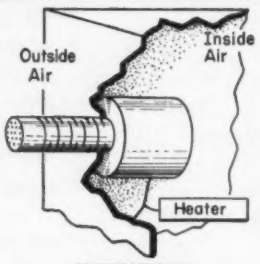
DIFFERENTIAL THERMOSTAT

Keeps temperature in any outdoor enclosure at fixed point higher than outdoors—automatically. Turns inside heater off when not needed.

Increases supplemental heat when needed during rapid temperature rise.

Rugged. Simple. Long-lived. Wide range of settings. Permits increased loads. Protects expensive equipment.

Let us know your protection problems and we will promptly send complete information.



APPLICATIONS
METAL CLAD SWITCHGEAR, MOTOR AND GENERATOR HOUSINGS. CONTROL HOUSES: BUS ROOMS. MECHANISM HOUSES. BATTERY CUBICLES. MACHINERY STORAGE BUILDINGS, ETC.

SYNTROL DESIGNS • **MARCELLUS, MICHIGAN**

GET Original FACTORY QUALITY

You are assured of highest quality when you specify Allis-Chalmers core and coil replacement assemblies. These are not rebuilt cores and coils, but completely new units, assembled and dried with the same skill and advanced equipment as standard A-C distribution transformers. All assemblies conform strictly to NEMA standards. They can be used in any make tank.

ALLIS-CHALMERS Core and Coil Replacement Assemblies

Complete Package for installation in 4 Simple Steps

All replacement units are packaged under oil in a specially designed metal container that protects against moisture and damage during transportation. Only 4 simple steps to install. Complete anchoring arrangement included with installation instructions.

Assemblies are available in ratings 25 kva and smaller, 15 kv and below. Use them in either conventional or protected types. Provision for mounting low voltage breaker, and a winding to operate signal light are standard.

Get more information from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 61B6345A. A-4885

Special moisture-proof package.

Complete replacement kit.

ALLIS-CHALMERS

News In Brief

(*Continued from page* 306)

equipment and supplies are readied and two-way truck radio becomes a vital link. Crews take stations at power switching points, substations and other locations where they are likely to be needed. Extra line and poles are stored at these locations too.

Wyoming Public Service Commission has approved the **transfer of 42 townships** in northcentral Converse County, Wyo., to the service area of Pacific P&L . . . The Wyoming commission also has taken under advisement a request of Montana-Dakota Utilities Co to **increase its electric rates** in the Sheridan, Wyo., area. Montana-Dakota filed its application after the city imposed a $30,000-a-year tax on the utility.

STEAM

Carolina Power & Light Co is installing a 180,000-hp, 467,000-lb generator as the fifth unit at its Cape Fear steam plant. Most powerful unit in the system, it is slated for January 1957 operation . . . Contract for **Memphis (Tenn.)** new municipal power plant may go to lowest bidder Consolidated Contractors of Memphis for $3,590,334. The 750,000-kw, $135-million plant, with site south of McKellar Lake, is to go on the line by July 1958, when Memphis-Tennessee Valley Authority contract expires.

Public Service Co of Colorado plans installation of a 110,000-kw, $3-million turbine generator at its Cherokee plant now under construction north of Denver. Delivery date is June 1958 . . . Construction on the third 20,500-kw turbo-generator for **Iowa Southern Utilities Co's** Bridgeport station is ahead of schedule, with virtually all concrete work, including turbine base, completed . . . Formal opening of **Oklahoma Gas & Electric Co's** Muskogee steam plant features public visitations and tours through the 177,500-kw facility.

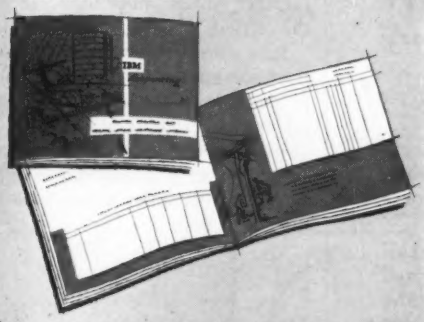
Montana-Dakota Utilities orders 44,000-kw steam turbine-generator for its new station near Sidney, Mont. Plant is designed to burn North Dakota lignite . . . Addition of two 160,000-kw generating units to present facilities is planned by **Florida Power & Light Corp.** Unit for 1959 completion will be located at Fort Myers.

A COST-FREE WAY TO DISCOVER

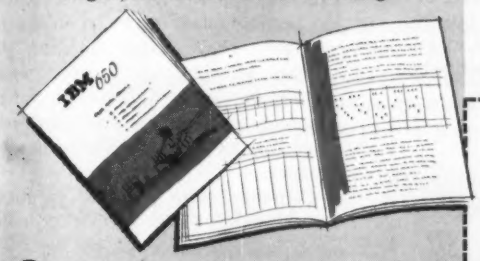
40 WAYS Public Utilities can get added profits from IBM Accounting

3 NEW GUIDES... FROM IBM

1. Customer Accounting. This 24-page booklet outlines the Customer Accounting procedure from initial application for service to accounts receivable statements.



2. General Accounting. This 44-page booklet is a guide to the IBM punched card documents and the machine reports you can get in such fields as: Property Accounting, Construction Accounting, Payroll (including check preparation and payroll tax reports), Operating Ledgers, and Electronic Data Processing.



3. Electronic Data Processing. This 16-page booklet describes the application of the IBM 650 to Customer Accounting operations, including an IBM 650 schematic program for Bill Calculation and Statistics.

Here are 40 opportunities for improving Public Utility accounting through IBM data processing. Several of these applications are actually by-products of other jobs. Many of them can be accomplished on present equipment . . . in *addition* to your current applications.

Now is the time to determine whether *your* machine accounting system is adequate for the increasing demands on your company. For today, new machines and improved applications hold the answer to a broader and even *more* profitable use of IBM methods.

The three folders offered here tell the complete story. With them you can decide for yourself *exactly* how and where you can start cutting costs . . . and giving even better customer service.

Send for your copies today—without obligation, of course.

Check list of 40 IBM data processing applications for electric, gas and water utilities

Use this list for a quick review of current applications. If you want to get even more from present equipment, or need further information on a *particular* application, just check off your area of interest . . . and send this list in with your coupon.

___Customer Billing
___Revenue Accounting
___Sales Analyses
___Rate Studies
___Government Tax Reports
___Merchandise Billing
___Merchandise Accounting
___Customer Accounts Receivable
___Accounts Receivable Control
___Collection Records
___Security Deposit Records
___Market Surveys
___Meter Control Records
___Meter Test Records
___Payroll Accounting
___Pay Checks and Earnings Records
___Pension Records
___Wage Studies
___Personnel Statistics
___Accident Records
___Savings and Loan Accounting
___Stores Accounting
___Physical Inventory
___Purchase Analyses
___Fuel Records
___Transportation Accounting
___Accounts Payable Accounting
___Expense Distribution
___Budget Reports
___Operating Reports
___Financial Reports
___Functional or Responsibility Accounting
___Insurance Records
___Engineering Studies
___Construction and Retirement Accounting
___Continuing Property Records
___Operating Ledgers
___General Ledgers
___Stockholders Records
___Dividend Checks and Proxies

IBM DATA PROCESSING

- DATA PROCESSING
- ELECTRIC TYPEWRITERS
- TIME EQUIPMENT
- MILITARY PRODUCTS

PUBLIC UTILITIES DEPARTMENT A56
International Business Machines Corporation
590 Madison Avenue, New York 22, N. Y.

Please send my FREE copy of:

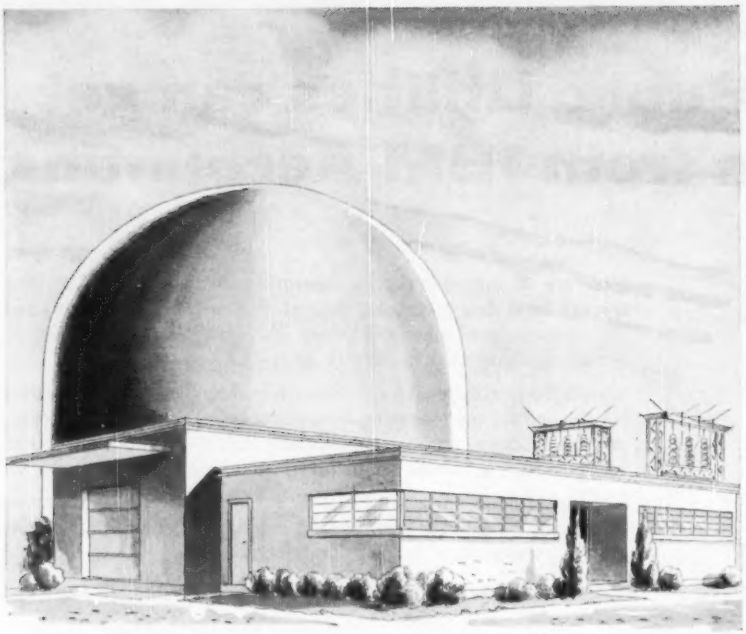
☐ IBM Customer Accounting ☐ IBM General Accounting
☐ IBM 650 Electronic Data Processing

Name_____

Company_____

Street_____

City_____ Zone_____ State_____



Experimental Boiling Water Reactor Plant

Argonne National Laboratory

Lemont, Illinois

engineering services by Sargent & Lundy

Scheduled for operation in early 1957

Throughout our 65 year history, Sargent & Lundy has been associated with many significant advances in the power industry.

From the time the country's first all turbine central station was designed in 1903 by Sargent & Lundy, the firm has continuously been active in the development of better and more economical steam electric plants, thus contributing to the high standing of the electric utility industry.

Now in the development years of nuclear power, Sargent & Lundy is responsive to this new engineering challenge and is actively engaged in this field.

SARGENT & LUNDY *Engineers*

140 South Dearborn Street
Chicago 3, Illinois

OUR 65th YEAR

TVA Steam Plants to Get 3 New Units

The Tennessee Valley Authority will build three new units for two of its steam plants at an estimated cost of $74 million and will pay for them out of its earnings.

The Johnsonville plant will get two of the units, with the third going to Gallatin, according to a recent TVA statement.

Earlier this summer TVA reported it would build four other units with its power earnings. Two of these are at Johnsonville, one at Gallatin and one at John Sevier.

The total cost for all seven is estimated at $184 million.

The generating capability of the three new units will be 75,000 kilowatts, which TVA said would be needed to meet anticipated needs in the Tennessee Valley region during the 1959-60 winter.

The Gallatin unit will be fourth. It and the one announced earlier have a generating capability of 275,000 each, making them the largest in the system. The capability of the two together will be more than five times the capacity of Norris Dam.

Johnsonville will have 10 units when the three are completed. The Authority is able to pay for the units from its earnings because it is ahead several years in its schedule of repaying to the United States Treasury money appropriated for facilities which have been previously built.

Memphis Unit Endorses Municipal Power Plant

Endorsement of the Memphis, Tenn., proposed municipal electric power plant by the city's Chamber of Commerce power supply committee has been coupled "with certain reservations". They include question of whether Memphis can contract with Tennessee Valley Authority to purchase any excess power which the proposed 750,000-kw municipal plant may produce.

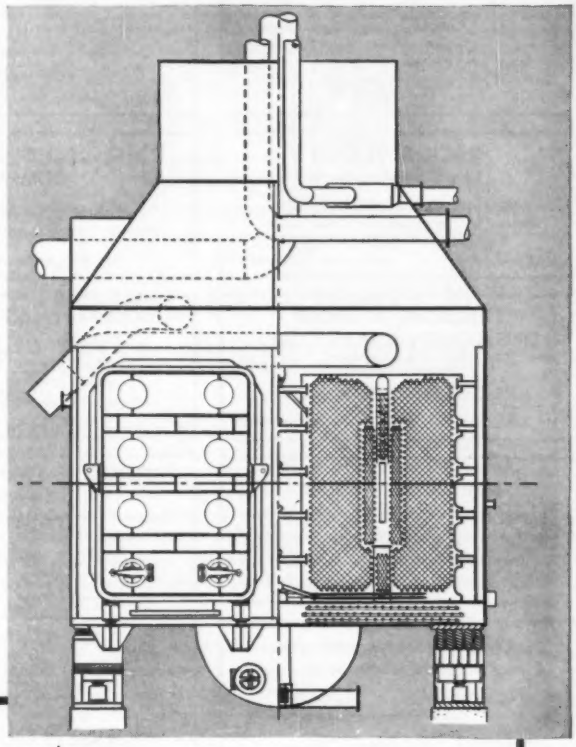
Committee also proposed creation of a Memphis Power Authority made up of citizens appointed by the City Commission who would serve without pay to administer operation of the plant. The Light, Gas & Water Division is now operated under a five-member commission.

Modern Dual Bank Condensers Pioneered by C. H. WHEELER

For 40 years C. H. Wheeler has led in steam power plant condenser design, from the first Dual Bank Condenser introduced to this country in 1916 to the most modern design for today's huge turbine-generators.

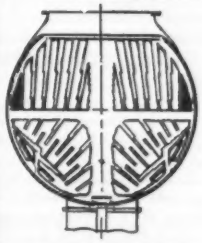
The latest C. H. Wheeler Dual Bank Condenser design for the largest metropolitan utility will provide 187,000 sq. ft. of surface to condense 1,600,000 pounds of steam per hour at 1.86 in. Hg. abs.

On the drawing boards now are new designs anticipating tomorrow's turbine requirements.

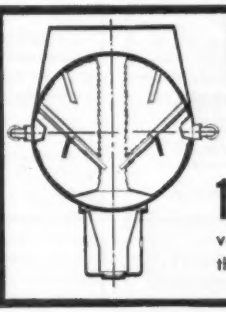


Modern Design Features..... 1956

1. **Specifically designed for today's larger, more efficient generating stations.**
2. **Adaptable to your station layout.**
3. **Lower pressure drop and higher vacuum. Additional steam lanes shorten path and resistance of steam travel.**
4. **"Zero" condensate temperature depression.**
5. **DEAERATION . . . 0.01 cc. per liter is attainable.**
6. **Airtight.**



1941 Additional steam lanes allowed steam to penetrate deeper. Further improvement in pressure drop. Better deaeration.



1923 Wider steam lane. Condensate temperatures corresponded to vacuum temperatures. Oxygen content less than 0.03 cc. per liter.

1916 An early C. H. Wheeler Dual Bank Condenser. Condensate temperatures approaching vacuum temperatures were achieved.

Let us tell you how our advanced designs will meet your operating requirements. Contact your local representative or

C. H. WHEELER MANUFACTURING CO., 19TH & LEHIGH, PHILADELPHIA 32, PA.

Manufacturers also of Vacuum Equipment • Marine Auxiliary Machinery • Centrifugal, Axial and Mixed Flow Pumps

C.H. Wheeler OF PHILADELPHIA

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Unique model tester as well as modern digital computer facilities available for low cost, accurate flexibility analyses of the most complex piping systems.

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specialize in
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Design • Construction • Reports • Appraisals

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THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | Civil Service Opportunities | Employment Agencies
Positions Wanted | Selling Opportunities Wanted | Employment Services
Part Time Work | Selling Opportunities Offered | Labor Bureaus

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The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—8 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to Classified Advertising Div. ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

AN EXCEPTIONAL OPPORTUNITY FOR YOUNG, SALES-MINDED ENGINEERS

A principal supplier of essential products for transmission and distribution is seeking men with some field experience, especially in the distribution category, plus electrical engineering training. Positions are in the sales engineering department where the individual must work cooperatively with customers and the production and engineering departments of the company. You will be part of a small group in close contact with management where your work will be recognized and appreciated, and where excellent opportunities exist for advancement. Both working and living conditions in Northern Ohio are exceptional. You will be associated with a company of the highest standing in its field.

Preferable age bracket is in the 30-35 year range. Some traveling will be required. Please give us a review of your educational and experience background, as well as any personal facts which you feel would pertain to prospective employment. A general statement as to salary requirements is desired. We assure you that all correspondence will be held in strict confidence.

Address Box P-2896, Electrical World, Classified Advertising Department. Post Office Box 12, New York 36, N. Y.

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Required by Operating Division of long established service and supervisory organization for large group of Electric Utilities located in eleven Latin American countries. Engineering assignments varied and interesting with responsibility. Some travel. Location New York. Usual employe benefits. Reply giving age, education, experience, personal particulars and salary expected.

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Unusual opportunity to advance quickly to executive in charge of new transformer plant

We are expanding our manufacturing facilities to include both distribution and power transformers.

The man we want will be holding a responsible position with heavy experience in the design and manufacture of modern transformers.

Future opportunities unlimited. Salary open. Give Personal history and work experience. Information strictly confidential. We will contact no references without your permission. Reply to

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H. K. PORTER COMPANY, INC.
2437 Fulton Street **Chicago 12, Illinois**

ELECTRICAL ENGINEER
TRANSMISSION SYSTEM DESIGN

Prefer 40-55 years of age. Extensive design experience on transmission lines and large substations up to 230 KV. Consulting engineering and main electric utility background highly desirable. System planning, construction and operation, and industrial plant design helpful. Supervisory experience with professionally trained personnel and proven ability in employee and client relations essential. Staff position in Home Office. Some travel. Exceptional opportunity with progressive firm. Liberal employee benefits including insurance and retirement plan.

Please write fully to

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Send Resume to
Manager of Employment & Placement
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With 5 to 10 years experience in electric, gas, or combination utility. Send detailed resume of education, experience, personal information, and salary expected to

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Unusual opportunity for consultant with technical training and thorough experience in electric power utility work, including steam electric plant design and operations. State age, education, experience and general qualifications. Small recent photograph desirable. Replies considered confidential.

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Attn: Engineering Dept.

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For responsible staff position which involves planning and staff engineering of new electrical power generation plants utilizing steam or gas combustion turbines and related facilities for major oil installation in Saudi Arabia.

Must be a graduate electrical engineer with proven supervisory ability with minimum ten years' experience in planning, design and study of utilities systems, power generation, transmission, distribution and related work. Minimum salary $1000 monthly plus allowances and generous benefits.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 180

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505 PARK AVENUE
NEW YORK 22, NEW YORK

EXPERIENCED RIGHT OF WAY ACQUISITION SUPERVISOR AVAILABLE
Many years experience in acquisition of right of ways for gas, petroleum lines and **electric transmission** right of ways, also project supervision. Thoroughly versed from title work to final phase of right of way. Available after September 1, 1956 either individually or with a group of experienced men. Reason for availability—temporary assignment completed.
PW-2796, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N. Y.

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
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CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Wanted—Man to take charge of diesel powered electric generating plant in mid west town of 2000. Write to Box MI P-2849, Electrical World.

Salesman electric equipment and recording devices. Electric utility experience desirable. Location Carolinas. Salary plus incentive. P-2813, Electrical World.

Rate Engineer with approximately 10 years of broad utility experience to appraise and prepare specifications for development of products and systems used by utilities. Engineering degree, knowledge of general utility economics, practices, rate, and finance policies essential. Needed by large New England manufacturer of utility used products to take responsible position in market and product development. Salary $9,500 to $11,000 dependent on qualifications. Reply P-2937, Electrical World, giving qualifications. Present position protected.

Accountant for small utility. Must be familiar with Pennsylvania Commission requirements for "B" Company. State qualifications, salary expected, and when available. P-2886, Electrical World.

SELLING OPPORTUNITY OFFERED

Sales Reps now selling to industrial accounts to sell nationally known line of incandescent and fluorescent industrial work lamps. Prefer men now selling electrical construction or allied products. Exclusive territories. Berlux Sales, 234 Fifth Avenue, N.Y.C.

POSITION WANTED

Distribution Engineer, age thirty six with nine years experience desires position with Public Utility. PW-2648, Electrical World.

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$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising apearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

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A.C. GENERATORS
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6—680/700 KW and 1—750 KW Used Ideal Electric and Manufacturing Company AC Generators, 2400 Volt, 3 Phase, 60 Cycle with 15 KW DC Exciters and Miscellaneous Switch Gear Equipment. Contact

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Room 534 Adams Building
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FOR SALE

5—OIL CIRCUIT BREAKERS

Whse. late type, outdoor type, De-Ion Grid, T.P.S.T., Rated 161000 V., 1200 amps., 60 cy., 3 ph., Type GO-3, Interr. Duty 1,500,000 KVA.

Fully complete—Cond. like new.

Price and further inf. upon request.

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NEW · REBUILT
WORLD'S LARGEST INVENTORY
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3	1500	A.C.	34,500—2300
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3	50	G.E.	22,000—2300
2	3000	G.E.	13800—600, 3 Ph. Unit Sub.
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MEETINGS CALENDAR

SEPTEMBER

American Institute of Electrical Engineers—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 17-19; Fifth Annual Industrial Electronics Symposium, sponsored jointly with the Institute of Radio Engineers, Hotel Manger, Cleveland, Ohio, Sept. 24-25.

• **Edison Electric Institute**—Industrial Relations Round Table Conference, Hotel Statler, Boston, Mass., Sept. 17-19; Street Lighting Committee, Hotel Statler, Boston, Mass., Sept. 19; Dealer Coordination Committee, Syracuse Hotel, Syracuse, N. Y., Sept. 19; Purchasing and Stores Committee, Executive Committee, EEI-Headquarters, N. Y.; Sept. 21; Market Research Committee, Cleveland, Ohio, Sept. 21; Meter and Service Committee, Purdue University, Lafayette, Indiana, Sept. 24-26; Farm Group Committees, Belmont Plaza, N. Y., Sept. 27-28; EEI-AGA Taxation Accounting Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 27-28.

Illuminating Engineering Society—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

Instrument Society of America—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

Missouri Valley Electric Association—Accounting Conference, Lassen Hotel, Wichita, Kansas, Sept. 20-21.

Southeastern Electric Exchange—Engineering & Operations Section, John Marshall Hotel, Richmond, Va., Sept. 20-21.

Atomic Industrial Forum, Inc—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

Pennsylvania Electric Association—49th Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

Electric Companies Public Information Program—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

OCTOBER

Edison Electric Institute—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

Illinois Institute of Technology—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio-Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

National Electronics Conference—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

American Institute of Electrical Engineers — Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

Canadian Electrical Manufacturers' Association—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

Indiana Electrical Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

Missouri Valley Electric Association—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

Southeastern Electrical Exchange—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

Standards Engineers Society—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

International Association Of Electric Leagues—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

• **Pennsylvania Electric Association**—Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Meter Committee, Split Rock Lodge, White Haven, Pa., Oct. 18-19; Communications Committee Meeting, Fort Stanwix Hotel, Johnstown, Pa., Oct. 22-23; Relay Committee Meeting, Hotel Robert Treat, Newark, New Jersey, October 25-26.

Rocky Mountain Electrical League—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

Interstate Power Club—Hotel Martinique, New York, New York, October 8.

• **Great Lakes Power Club**—Fall Meeting, Durant Hotel, Flint, Michigan, Oct. 11-12.

Inter-Industry Farm Electric Utilization Council—National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

Iowa Utilities Association—Annual Management Conference, Hotel Fort, Des Moines, Iowa, Oct. 15-16.

American Institute of Electrical Engineers—Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24.

American Standards Association—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

University of Texas—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

National Safety Council—44th National Safety Congress & Exposition, Chicago, Illinois, Oct. 22-26.

National Association of Corrosion Engineers—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

Northwest Public Power Association—Power Use Section, Franklin PUD Auditorium, Pasco, Washington, October 25-26.

Montana State Rural Electric Cooperative Association—Annual Meeting, Lewiston, Mont., Oct. 29-31.

NOVEMBER

National Rural Electrification Cooperative—Region Nine Annual Meeting, Davenport Hotel, Spokane, Washington, November 12-13.

National Electrical Manufacturers Association—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, November 12-16.

Edison Electric Institute—Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

American Society of Mechanical Engineers—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 25-30.

Great Lakes Conference of Railroad and Utilities Commissioners—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

• Additions this week

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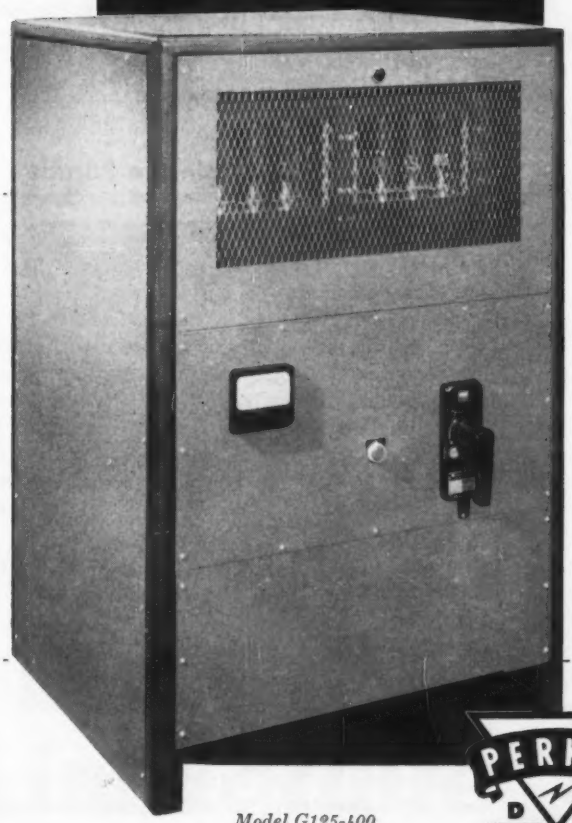

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READERS FORUM

LBE Editorial Draws Support

To the Editor:

I was so pleased to read this week's (Aug. 20) editorial on the "Live Better—Electrically" program.

It is so obvious that a coordinating committee is needed for the reason that it is very noticeable that few of the manufacturers are using all of the media for the promotion. It should spread to all dealer advertising as well as manufacturers. Never have we had such a promotion, and it is developing alarmingly slow.

We all liked your editorial.

B. L. England
President

Atlantic City Electric Co
Atlantic City, N. J.

EW Is Getting Lively

To the Editor:

I don't know if your staff is growing younger or if you folks are just kicking up your heels in the green pastures under the summer sun. But I have noticed a decided upturn in liveliness of Electrical World lately. I just want to cast one vote in favor of it.

The last three issues I couldn't put down and read from cover to cover.

Wayne Adams

Bozell & Jacobs, Inc.
2 West 45th Street
New York 36, N. Y.

• Looking into our mirrors we know that we are getting older day by day. Let's attribute any change to a staff of editors eager to do a good job for the industry.

Rigid Rate Schedules Unnecessary

To The Editor:

The difficulties which beset R. E. Caywood, as outlined in your write-up in the July 16 issue, in finding suitable electric utility rate schedules might be relieved to a great extent if he would give just a little consideration to the development of some rate schedules based on a reasonably close estimate of the cost of service to include a suitable return on investment.

May I offer a possible price philosophy, that marches step by step with Mr Caywood, as follows:

Electric utility rates should be based on a philosophy which calls for the lowest possible prices consistent with customer use of the service, fair wages, and a good return to the utility. Rates should be based upon the computed cost of service without regard to the purpose or use to which it is put and should include such elements of promotional value as may be justified. Rates stemming from true cost-of-service values will automatically provide lower prices for larger loads and for longer use of service.

Mr Caywood does not seem to know that the electric utilities in some states, particularly New York and Massachusetts, have very free hands in the matter of making and changing rate schedules and rules and regulations as to service. In Massachusetts an electric utility can under the law make as many special contracts with any of its customers as it may wish—and need only file a copy with the Department of Public Utilities.

The so-called rigidity of the electric utility rate structure could be entirely overcome if the utility did not wish to apply a higher rate to commercial consumers than to residential customers. It seems to me that the things that bother Mr Caywood result from policy decisions of the utilities themselves and that changes in those policies could readily reduce the rigidity if it is really desirable.

Carroll H. Shaw
Consulting Engineer

132 Nassau Street
New York 38, N. Y.

Kvarin and Kvarex Join the Parade

To the Editor:

Here in Jamaica I do not get to see Electrical World regularly. Just recently I came across the Jan. 9 issue and became very interested in the letters from readers on abbreviations for reactance loads.

As regards the designation of reactive, I would like to suggest that it be designated as import or export depending on whether it be produced in or consumed by a system or machine in the same manner as kilowatts may be regarded as import or export. I do not see that any real purpose will be served by further abbreviations, but just for fun, why not kvarin and kvarex, like some new breakfast food?

H. C. Marrett

Jamaica Public Service Co
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Jamaica, B.W.I.

When Did You Write to the Editor?

Letters for publication from readers are always welcome, especially those which contribute to the knowledge of the industry. Choose your own topic, write what you think, sign your name and address, and mail it to the editor.

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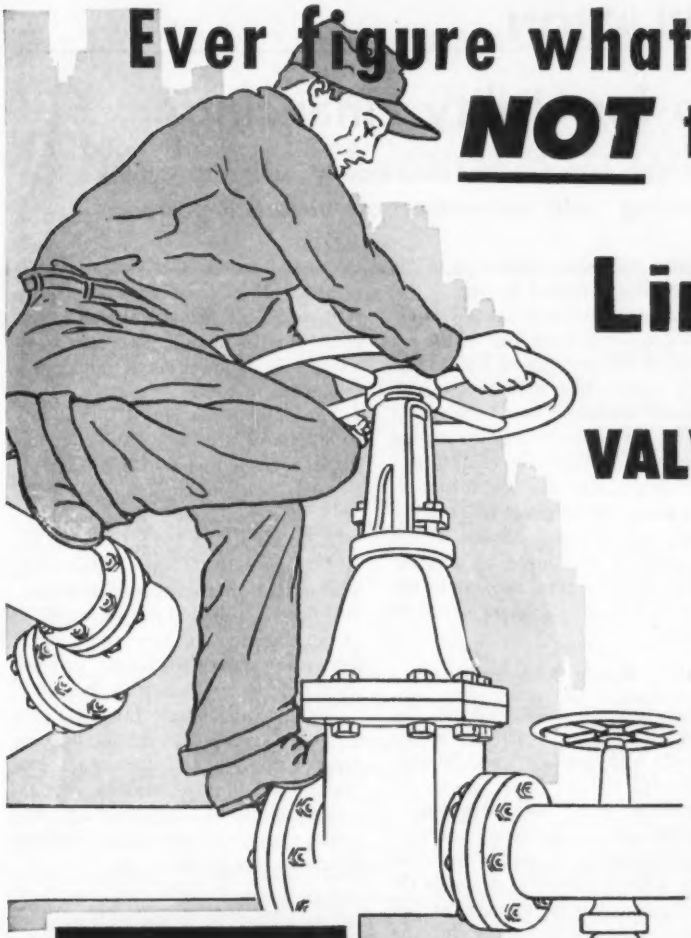

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Higher Debt Ratio for Utility Financing?

SEC launches study to determine appropriate debt-equity ratios for utility financing. Chairman Armstrong calls economies of 'utmost importance'

Concern over the rising cost of money, coupled with the growing demands of utilities for new capital, has led the Securities and Exchange Commission to launch a study of utility capital structures.

A detailed questionnaire has been forwarded to utility companies, federal and state regulatory agencies, insurance companies, security analysts, and others who may have an interest in the matter.

By and large, the SEC questionnaire asks for the views of those questioned on what appropriate capitalization ratios should be in a number of hypothetical cases. Replies are required by Nov. 1. On the basis of the study, SEC will decide whether to draft for public comment a proposed statement of policy on capitalization ratios.

Study to Find Appropriate Ratio

SEC Chairman J. Sinclair Armstrong said that the results of the study would be applicable to registered public utilities and their operating subsidiaries whose financing proposals are subject to SEC jurisdiction under the Public Utility Holding Co act of 1935.

Armstrong said the study would concern itself with the appropriate proportions of the capital structures of these companies, both on an over-all consolidated basis and on an individual operating company basis. Consideration will be given to what properly may be represented by long-term debt, preferred stock, and common stock and surplus, and also to the appropriate limitations in the relative amount of short-term bank borrowings.

Promote Economy in Financing

The SEC chairman pointed out, in announcing the study, that the holding company act seeks, among other things, to promote economies in the raising of capital by holding companies and their subsidiaries. He noted that Section 7 of the act, provides that SEC need not permit a financing declaration to become effective if it finds that the security is not reasonably adapted to the capital structure of the issuing company and other companies in the same holding company system.

Where a financing is entitled to exemption under Section 6(B) of the act because of its approval by a state regulatory agency, SEC may impose such terms and conditions as it feels appropriate in the public interest or for the protection of investors or consumers.

Armstrong said the commission is keenly aware of the direct effect of the over-all cost of raising capital on the rates charged consumers of utilities, on the rate of return allowed to the utility, and on the ultimate return to investors.

Investors Would Also Suffer

"Any lack of economies in the raising of capital inevitably affects adversely both consumers and the general public; and, in the long run, investors also suffer," said Armstrong.

"In the light of expanding and continuing growth of the public utility industry, with its enormous demands for new capital, it is of the utmost importance that public utility holding companies and their operating subsidiaries subject to the act raise their new capital requirements in a manner designed to achieve the greatest economies possible," Armstrong added.

SEC policy with regard to capital ratios has been set forth in previous reports and rulings.

Previous SEC Decisions Cited

In its 1944 report to Congress, the Commission stated:

"A balanced capital structure provides a considerable measure of insurance against bankruptcy, enables the utility to raise new money most economically, and avoids the possibility of deterioration in service to consumers if there is a decline in earnings."

In a 1951 report to a Congressional subcommittee, SEC said:

"An adequate equity cushion to absorb the vagaries of business conditions is an important attribute of a good security."

In a 1949 case involving General Public Utilities Corp SEC expressed the view, among other things, that it regarded 25% common stock equity ratio as a floor below which common stock equities should not drop or to which existing lower ratios should, as a minimum, increase.

The commission added that it had continuously striven to have common stock equities maintained at, or increased to levels substantially above 25% of capitalization and surplus.

Subsequently, in 1952, in a case involving Eastern Utilities Associates, SEC stated that generally speaking, long-term debt should not exceed 60% of capitalization and surplus and common stock equity (including surplus) should not be less than 30% thereof.

SEC told the Senate Interstate and Foreign Commerce Subcommittee in May of this year that there had been "substantial improvement in capitalization ratios" of utility holding companies since enactment of the Holding Company Act in 1935.

Penn P&L Asks Court to Reverse Rate Cut Order

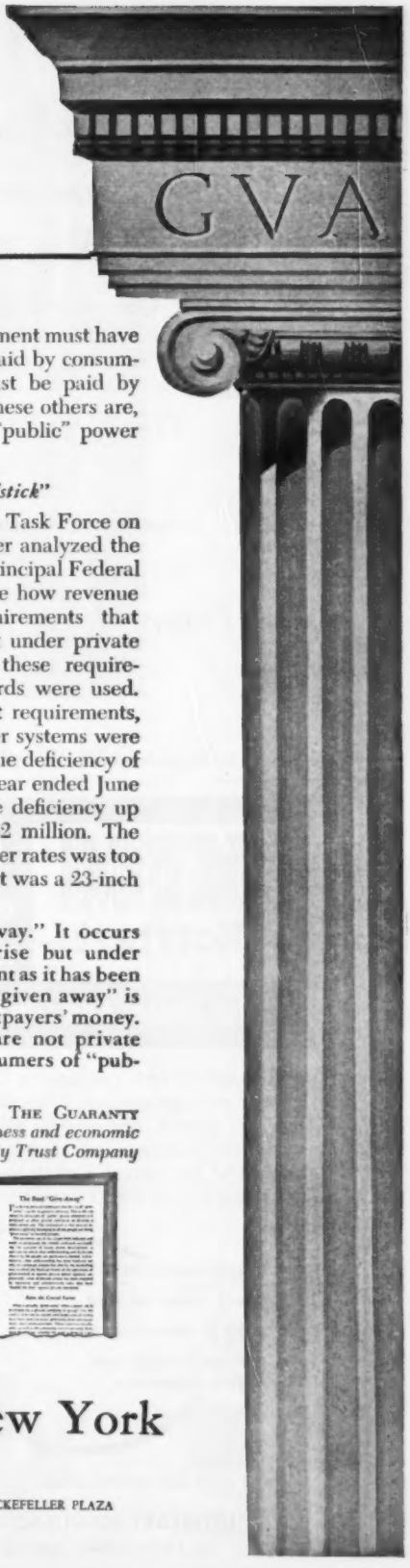
Pennsylvania Power & Light Co has appealed to the Superior Court to reverse the rate order of the Public Utility Commission which reduced electric rates by $1,366,156 annually and ordered $1.9 million in refunds (EW, August 20, p 98).

With the appeal the company also filed a request for a stay of the rate reduction and refunds pending a final decision by the court on the validity of the PUC's order.

Pres Chas. E. Oakes of the company said that the request for a stay was to protect the utility from double jeopardy in the event the order should not be upheld.

The PP&L president said that the company had appealed the order because it believes that the principles of rate making involved are so important that they should be thoroughly aired and tested in the courts.

The Real "Give-Away"



IT is during political campaigns that the cry of "give-away" reaches its greatest intensity. This is the cry raised by advocates of "public" power whenever it is proposed to allow private enterprise to develop a water-power site. The implication is that natural resources rightfully belonging to all the people are being "given away" to favored groups.

Rates the Crucial Factor

What is actually "given away" when a power site is developed by a private company or group? The site itself is of no use to anyone until large sums of money have been spent for dams, generating plant and equipment, and transmission lines. These expensive installations, as well as the continuing cost of operating them, must be paid for, whether the work is done by a privately owned company or by a governmental agency. If the rates charged for the power are sufficient, and only sufficient, to meet the cost of operation and provide a fair and reasonable return on the invested capital, nothing is "given away." The users of the power pay, and the company receives, what the power is worth, neither more nor less.

Private companies and the investors in their securities pay heavy taxes, and their rates must include reimbursement for these taxes. Governmental agencies are largely exempt from taxation, as are the investors in their securities.

This creates the illusion that "public" power is cheaper than "private" power. The truth is that it is cheaper to the consumer but not to the people as a whole. It is cheaper to the consumer only because he receives the benefit of tax exemptions and other forms of subsidy which are not granted to the consumer of privately produced power. Since government must have its revenue, the taxes not paid by consumers of "public" power must be paid by others, which means that these others are, in effect, subsidizing the "public" power consumers.

The Power "Yardstick"

The Hoover Commission Task Force on Water Resources and Power analyzed the financial condition of the principal Federal power systems to determine how revenue compared with the requirements that would have had to be met under private operation. In computing these requirements, very liberal standards were used. Measured by these modest requirements, the principal Federal power systems were found to have a total revenue deficiency of nearly $76 million for the year ended June 30, 1953, and a cumulative deficiency up to that date of nearly $332 million. The Federal "yardstick" for power rates was too short by some 40 per cent; it was a 23-inch yardstick.

This is the real "give-away." It occurs not under private enterprise but under "public" power development as it has been and is practiced. What is "given away" is not natural resources but taxpayers' money. And the favored groups are not private power companies but consumers of "public" power.

From the September issue of THE GUARANTY SURVEY, *monthly review of business and economic conditions published by Guaranty Trust Company of New York.*
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Big Bond Holders

Investment firms hold more than billion in utility securities

More than $1 billion worth of public utility securities were held by investment companies at mid-1956, the National Association of Investment Companies revealed recently.

The association's 152 members showed that they owned securities in 264 public utilities amounting to $1,151,862,000. Common stocks account for $917,186,000 or 80% of the total.

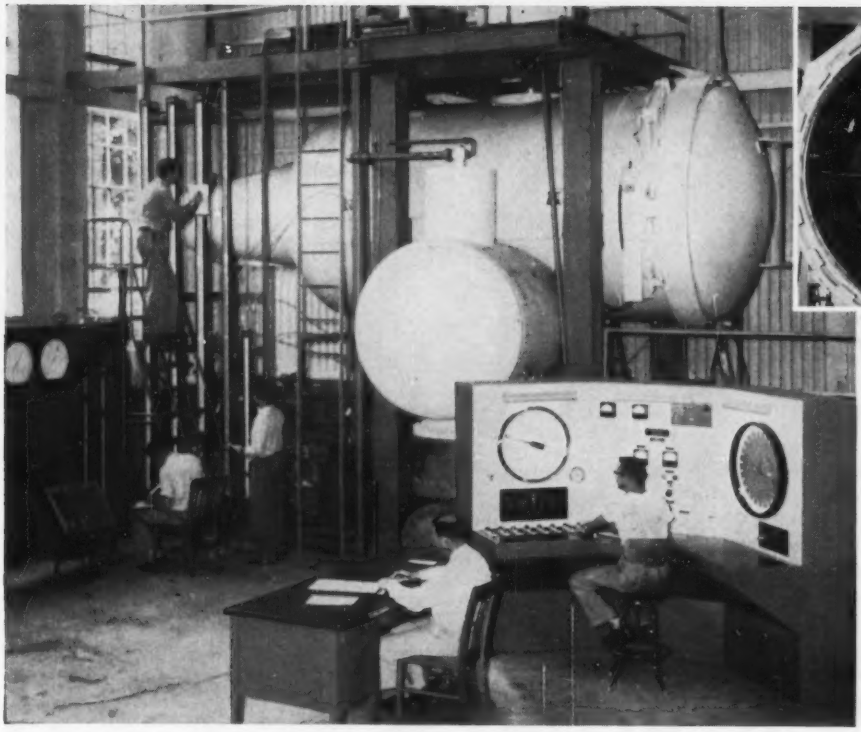
The 20 largest utility holdings (based upon aggregate holdings of securities) are as follows:

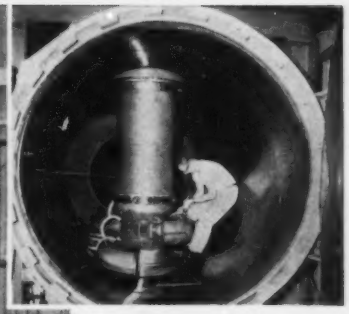
Company	$ Value of Holdings (000)
American T&T	$46,943
Tenn Gas Transmission	36,244
Gen. Public Utilities	35,056
Central & South West	34,784
Texas Utilities	32,872
American G&E	31,877
United Gas	30,043
Southern Co.	28,611
Niagara Mohawk Power	27,979
Middle South Utilities	27,817
Florida Power & Light	25,891
American Natural Gas	22,081
Consolidated Edison	21,082
Southern Calif. Edison	20,750
Virginia Electric & Power	19,288
Columbia Gas System	19,084
Illinois Power	18,706
Panhandle Eastern Pipeline	18,318
Consolidated Natural Gas	18,138
El Paso Natural Gas	17,465

Bonds of American & Foreign Power Corp and United Gas Corp, the report said, are most popular, each owned by 17 investment companies. A&FP bonds are worth $16,824,000, making it the largest holding in market value, while the United Gas Bonds are worth $5,257,000, third in market value of bonds held. Second place in market value is held by bonds of Tennessee Gas Transmission Co, worth $9,992,000, and owned by 14 investment companies.

The most widely-held preferred stock is the $7,626,000 Pacific Gas Electric Co preferred, owned by 29 investment companies.

(*Continued on page* 326)





A complete model turbine wheel case assembly, built to extreme accuracy, is shown being mounted in the testing chamber.

New high head test stand in the SMS Hydraulic Laboratory, including control panel and gages.

High Head Turbine Test Stand At SMS Laboratory DUPLICATES FIELD CONDITIONS

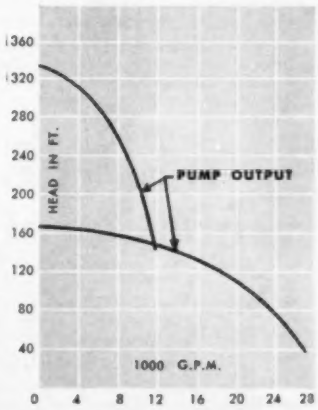
With the addition of its new high head test stand, the SMS Hydraulic Laboratory can now test homologous model turbines under controlled conditions that *duplicate* those found in the prototype installations. This is a substantial stride forward in hydraulic turbine research, since the complete reproduction of actual field conditions has not previously been possible.

The outstanding features of this new facility are:

- World's highest artificial testing head.
- Flows of 5,000 g.p.m. under 300-foot head, and 21,000 g.p.m. under 100-foot head.
- 300 H.P., 0 to 6,000 R.P.M., eddy current dynamometer.
- 100-ton water cooling system to maintain prototype water temperature.

Both basic research and formal contract acceptance tests are performed here. Test stand equipment permits testing of all Kaplan and Propeller, as well as many Francis turbine designs, under conditions of *head* and sigma that *duplicate* those found in the field. This provides a high degree of testing accuracy and permits accurate testing of settings that cannot be satisfactorily field tested.

For further information on the significance of this high head test stand, write to S. Morgan Smith Co., York, Pa.



Pump Head-discharge Curves for Series and Parallel Operation.

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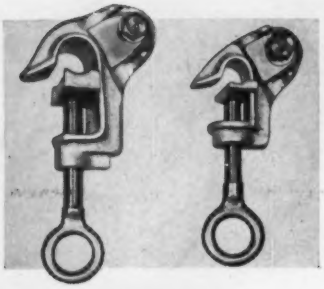

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- ALL NON-FERROUS CONSTRUCTION
- TWO SIZES for all combinations copper and aluminum conductors.

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From Fantasyland to Tomorrowland, Marcus Transformers provide trouble-free, uninterrupted service in Disneyland—fun capital of the world. Your business, too, can profit by using the transformers that are setting new standards for the industry. For transformers that exceed specifications, order—*MARCUS.*

A complete line of dry type and liquid-filled transformers through 5000 KVA.

MARCUS
TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY
"Mark of Quality"
Representatives in Principal Cities

Big Bond Holders

(*Continued from page* 324)

Middle South Utilities, Inc, is held by more investment firms than any other utilities security of any class, the report stated. Its common is held by 41 investment companies, while 40 hold American Telephone & Telegraph Co stock.

San Diego G&E Puts In New Electric Rate Plan

San Diego Gas & Electric Co put a new electric rate schedule into effect Sept. 1. Only change for residential users is that customers who aren't on line-extension contracts will not have a minimum charge applied for large heating or power loads.

For general service—businesses and small industries—customers with three-phase or combination single and three-phase service will come under the schedule previously applied only to single-phase service. A surcharge will be added, however, 40¢ per month per hp of connected polyphase load. Single-phase rates will remain the same. Military and large industrial customers get a new rate schedule that sets $150 as monthly minimum charge.

15 Industries Will Fight Rate Hike at Niagara Falls

Fifteen major industries in Niagara Falls, N. Y., have unanimously pledged to fight the proposed rate increase in 25-cycle electric power by the Niagara Mohawk Power Corp.

A statement made public in the wake of a meeting of industrial representatives said the group will employ legal counsel to carry their protest to the New York Public Service Commission.

Their statement, released by E. Dent Lackey, public relations manager of the Carborundum Co, called the proposed rate increase "exhorbitant" and "not justified" in terms of the loss suffered by the power firm in the destruction of its Schoellkopf generating plant.

Meanwhile, City Manager Charles B. Wright said he was attempting to canvass members of the City Council

(*Continued on page* 328)

MOLONEY BUILDS

"Longer life and greater efficiency"

into Class H Transformers...

¼" Type 3 Quinterrabord being placed between the legs of a Class H transformer where it acts as a phase barrier.

⅛" Quinterrabord yoke insulation between yoke and high voltage winding. Moloney perforates it to allow circulation of nitrogen gas for cooling. 1/32" Quinterrabord is used as frame insulation (not shown).

...with J-M Quinterrabord® Type 3 Electrical Insulation

In keeping with the trend toward higher temperature operation of electrical equipment, Moloney Electric Company, St. Louis, Missouri provides the ultimate insurance against failure—J-M Type 3 Quinterrabord. Incorporated in sealed nitrogen filled transformers, the lasting insulation value of J-M Type 3 Quinterrabord insures long life and efficiency with no possible chance of shorting out under continuous high temperature or overload.

Type 3 Quinterrabord is a specially processed sheet of highly purified asbestos fibres, subsequently treated with silicone. This treatment insures moisture and corrosion resistance. Free from impurities, uniform in texture and thickness, Quinterrabord has high pyrolysis resistance (thermal stability) and lasting dielectric strength. As installed, it is not cured so remains somewhat flexible. Then, when subjected to increased temperature and pressure in operation, curing takes place with a resultant increase in mechanical and electrical properties.

Folder EL-89A gives the complete story. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

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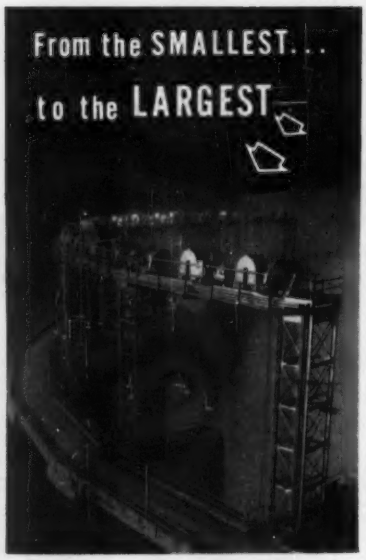
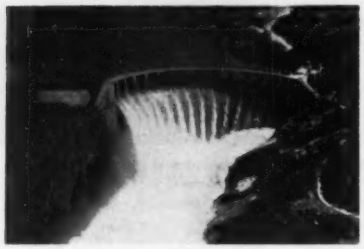
Johns-Manville ELECTRICAL INSULATIONS



MURCO GATE HOISTS



MURCO Gate Hoists are designed for any size power dam and built in a wide range of capacities—from over 100 tons down to less than 1 ton . . . from the largest motor operated gate hoist to the smallest hand operated hoist . . . back of every MURCO Gate Hoist are over 70 years of designing and building gate hoists. From this experience we have accumulated designs and patterns that may fit your requirements. In planning power dam gates, we suggest you write us before your plans for the project as a whole are completed . . . it may save you expense and important preparation time.

Write for complete information and Engineering Department recommendations.

D. J. MURRAY MANUFACTURING CO.
MANUFACTURERS SINCE 1883
WAUSAU, WISCONSIN

15 Industries Fight

(*Continued from page* 326)

to find out if the city should protest the rate increase before the PSC. He declined comment on the fairness of the boost.

"This is a policy matter for the council to decide," he noted. "If they decide to protest, the corporation counsel will contact the PSC."

FINANCIAL BRIEFS

Wyoming's Public Service Commission is studying applications of **Pacific P&L and Riverton Valley Electric Association** for authority to serve an overlapping area of Fremont County . . . Monongahela Power Co has created an optional residential **rate schedule for all-electric home.** Schedule AE applies only to customers having electric water heaters. It includes a floating block of 300 kwhr at 1¢ and a new bottom block of 1.4¢/kwhr power after monthly consumption passes 650-kwhr mark. This reduces cost of electric house heating about 20%.

Healthy growth also is forcing **Delaware P&L to accelerate its construction** program for 1956-1958. Revised program now calls for an increase of 160 Mw in generating capacity, not including that to come from new Delaware City Power Station some time this year.

Electric Power Board of Chattanooga has set a goal of 21,500 kwhr per customer for 1965. This year, ending June 30, customers averaged usage of 10,007 kwhr each. Number of customers were 70,126.

Citizens of Seneca, Mo., have voted down a proposal to build a city-owned electric system with power supplied by Southwestern Power Administration. Empire District Electric Co serves the community. . . . **Utilities doing business in West Virginia** have been handed a $33-million increase in tax valuation. Appalachian Electric Power Co runs second only to Chesapeake & Ohio Railway as a taxpayer. The railroad is assessed at $108 million, the utility at $102 million.

(*More F&R Briefs on page* 330)

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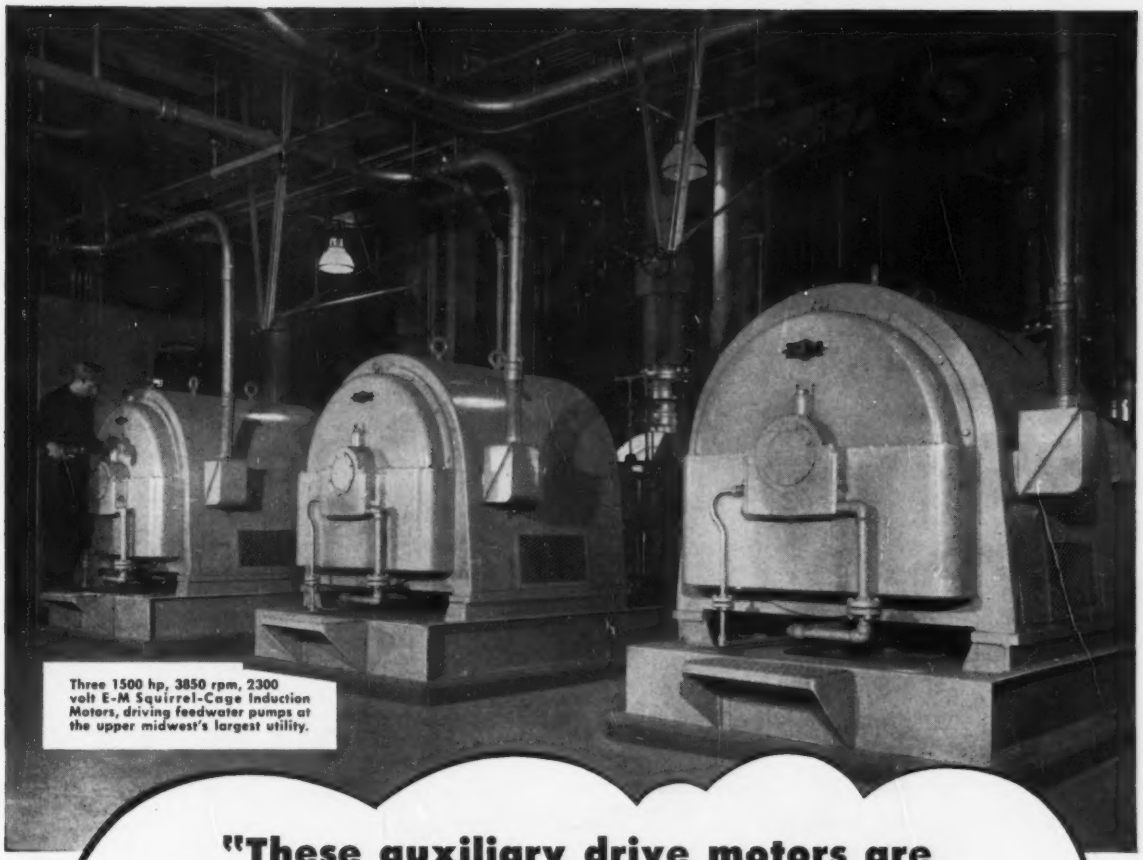

Three 1500 hp, 3850 rpm, 2300 volt E-M Squirrel-Cage Induction Motors, driving feedwater pumps at the upper midwest's largest utility.

"These auxiliary drive motors are protected against moisture and vibration!.."

"Large auxiliary drive motors need a lot of extras," says Pete Powerhouse, E-M engineer and specialist in their application.

"We protect stator coils with the best step-by-step 'Power House' insulation process involving vacuum-pressure impregnation and multiple varnishing and baking of the entire winding. Coil ends are ruggedly lashed to one another and to heavy bracing rings to guard against distortion.

"You'll find our motors run smooth and quiet . . . aerodynamic blower design and rotor streamlining keep noise level to a minimum. Speaking of the rotor, we make sure it's stiff, strong and precision balanced. And bearings are *Kolene* processed and centrifugally cast to really last.

"So, if you want to forget about factors such as high humidity, fumes, moisture, vibration, noise, etc., ask your nearest E-M sales engineer to show you why E-M *Customized* Motors are so well suited to exacting power station demands. And be sure to check the publications listed below."

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Financial Briefs

(*Continued from page* 328)

Southern California Edison Co has filed application for a general rate increase with the California Public Utilities Commission to offset increasing costs of generation and distribution. Rates would increase annual revenues approximately $13.5 million, or about 6.5% on estimated 1957 revenues, and would add around 15¢ a month to the average household bill. If authorized, new rates are not expected to become effective until after 1957.

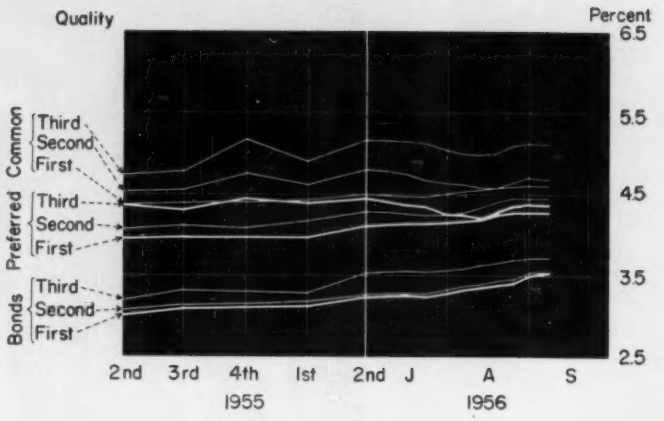
Rochester Gas & Electric Corp has sold quickly 60,000 shares 4.95% $100 par preferred stock at $100 a share through an underwriting group headed by First Boston Corp . . . **"The Key Employees Stock Ownership Plan" of the Montana Power Co** has been approved by the Federal Power Commission. FPC has authorized the company to issue 100,000 shares of no par value common stock under the plan, which grants to officers and key employees of the company options to buy up to 100,000 shares.

Northern Indiana Public Service Co will triple the generating capacity of its new station in Gary in the next three years by adding two more 138-Mw units to the one now being installed.

Resale of power by building companies to their tenants may produce a lawsuit against City of Seattle, Wash., by several downtown building companies. Metropolitan Building Co, under contract with Puget Sound P&L, resold power in Exchange and Medical & Dental Buildings. Seattle City Light took over the utility's local operations in 1951 and has served notice that power resale will stop. But Metropolitan contends that Seattle must live up to the contract it originally made with Puget Sound P&L.

In Ohio, Manfield's City Council has enacted a **new electric rate ordinance** called "unacceptable" by Ohio Edison. Contract permits an increase of 75¢ to $1.50 in minimum charge. **Company asked for** a $93,000 increase in cost of street lighting, but agreed to a general cut in domestic rates. The ordinance calls for about a 3% cut in domestic rates.

Today's Utility Yields (%)



Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Sept. 6	3.53	3.56	3.73	4.30	4.44	4.61	4.37	4.67	5.09
Aug. 30	3.50	3.55	3.72	4.28	4.44	4.61	4.38	4.72	5.11
Aug. 23	3.41	3.46	3.70	4.27	4.43	4.59	4.35	4.63	5.09

Utility Earnings . . .

Company	Period Months Ended		Net Income 1956	Net Income 1955	Earnings Per Common Share 1956	Earnings Per Common Share 1955
American Gas & Electric	12	July	$39,772,225	$36,313,272	$2.04(a)	$1.88(a)
Arizona Public Service	12	July	5,966,000	5,146,000	1.50(a)	1.43(a)
California-Pacific Utilities	12	July	733,276	666,493	2.24(a)	2.20(a)
Central Maine Power	12	July	6,437,338	6,589,570	1.67	1.72
Citizens Utilities	12	June	1,061,000	1,006,000	1.08	1.02
Consumers Power	12	July	31,301,897	27,830,174	3.34(a)	3.12(a)
Dallas Power & Light	12	July	7,573,915	6,960,738	....	....
Dayton Power & Light	12	June	10,568,000	9,014,000	....	....
El Paso Electric	12	July	2,395,301	2,107,858	2.50(b)	2.35(b)
Gulf Power	12	July	2,818,631	2,216,568	....	....
Gulf States Utilities	12	July	10,729,297	10,014,258	2.18	2.01
Housatonic Public Service	6	June	330,137	322,432	0.86	0.87
Iowa Southern Utilities	12	July	1,486,238	1,295,078	1.82	1.57
Middle South Utilities, consolidated	12	July	15,466,661	14,736,789	2.04	1.94
Mississippi Power	12	July	2,451,754	2,113,391	....	....
Mississippi Power & Light	12	July	4,373,169	3,993,755	....	....
Ohio Edison, consolidated	12	July	24,335,727	22,216,412	3.72	3.35
Pennsylvania Power	12	July	2,949,537	2,748,752	....	....
Pennsylvania Power & Light	12	July	24,025,577	21,848,913	3.41	3.05
Public Service of Indiana	12	July	13,431,463	12,463,440	2.45(c)	2.41(c)
Quebec Power	6	June	577,909	543,364	0.86	0.81
City of Seattle	12	June	5,409,032	5,638,486	....	....
Shawinigan Water & Power	6	June	5,430,668	4,128,371	2.02	1.50
South Canada Power	10	July	1,397,512	1,211,269	....	....
Texas Electric Service	12	July	12,058,021	10,489,317	....	....
Texas Power & Light	12	July	11,055,242	10,244,848	....	....
Texas Utilities, consolidated	12	July	26,335,639	23,798,911	2.16(f)	2.02(f)
Virginia Electric & Power	12	July	20,373,687	18,567,638	2.70	2.47
West Penn Electric, consolidated	12	July	17,812,394	16,787,484	2.10	1.98

Notes: (a) Based on average shares; (b) Based on 896,412 shares in 1956 and 840, 387 shares in 1955; (c) Based on 4,402,797 shares in 1956 and 4,251,060 shares in 1955; (f) Based on 12,210,000 shares in 1956 and 11,810,000 shares in 1955.

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Where can YOU use G-E silicone rubber?

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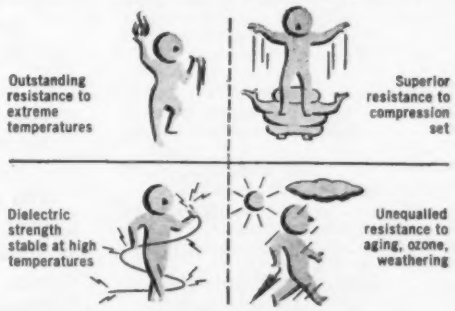
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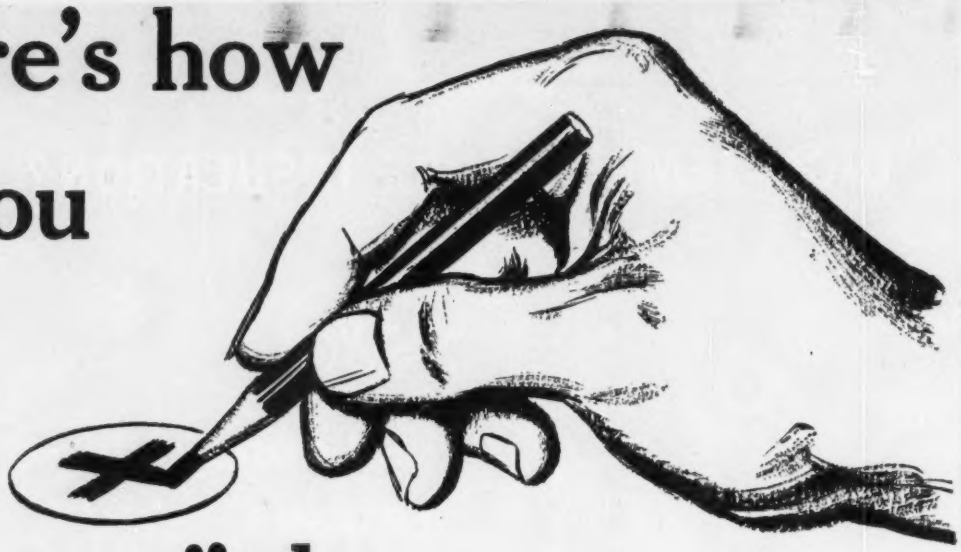

Much as we revere and respect this system of ours, we don't want the government running our lives.

The best government is one that's closest to the people. And there's just one way to keep it under control.

Vote.

Every time you get a chance.

Vote November 6, for sure.

Vote to elect the ones you want representing you. To keep the ones who are doing you proud. To get rid of the ones who are not so hot.

You're the boss, however you vote. No matter who's elected, you pay their salaries and paint their offices and keep watching over them as they work.

Even if the ones you're "agin" happen to win, they're obligated to the minority, too. They're servants of *all* the people, not just those who voted for them.

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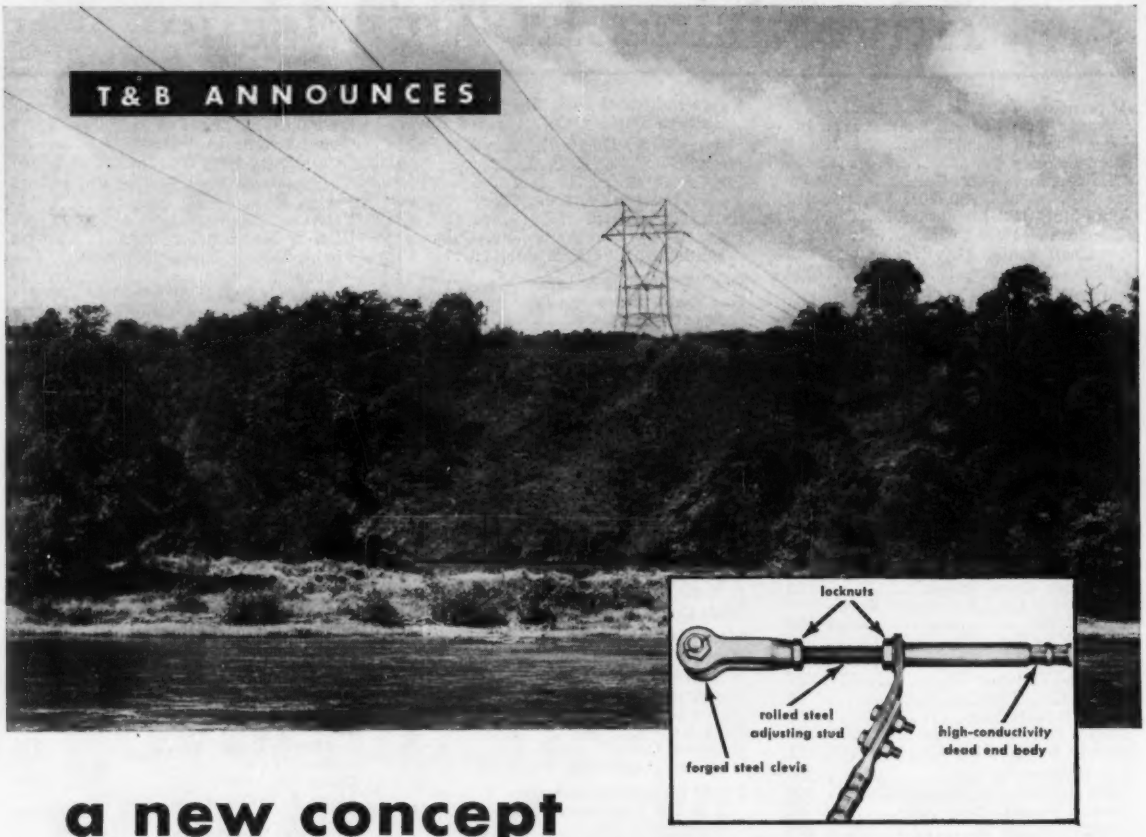

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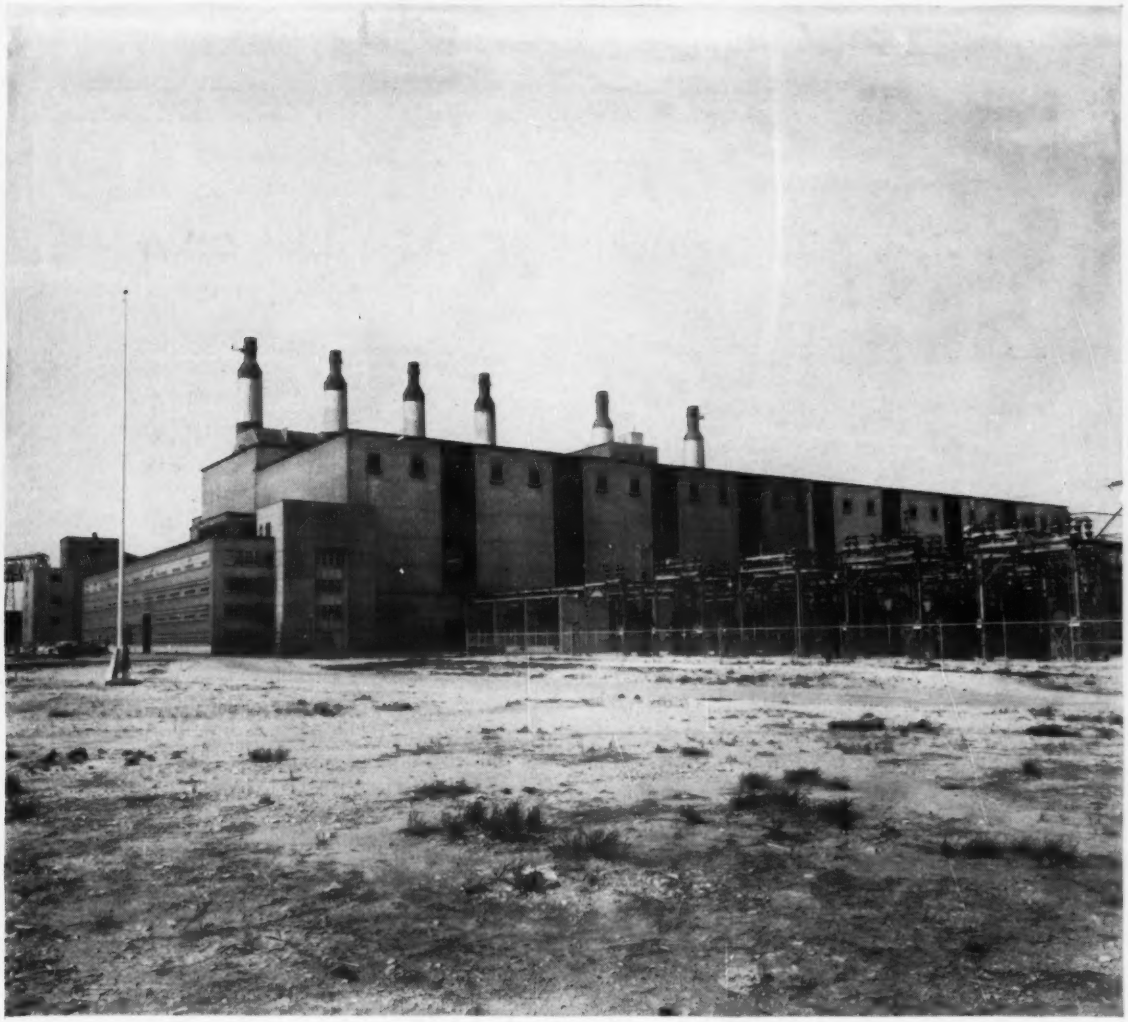

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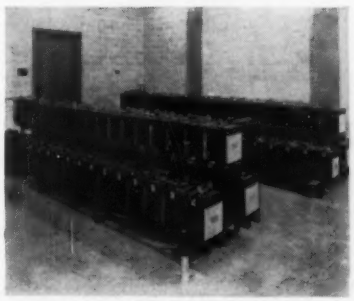

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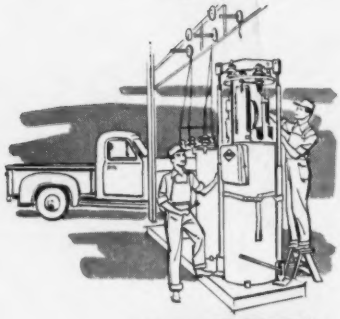
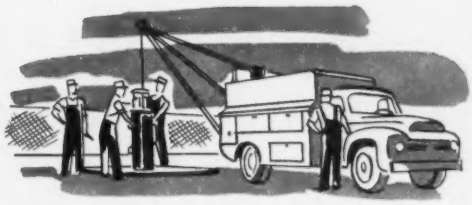
Servicing Allis-Chalmers Regulators **vs** **Servicing Other Regulators**





1—Drain oil from tank

2—Remove cover, bushings and control leads

3—Piecemeal untanking

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